AVIATION WEEK

DEC. 27, 1954

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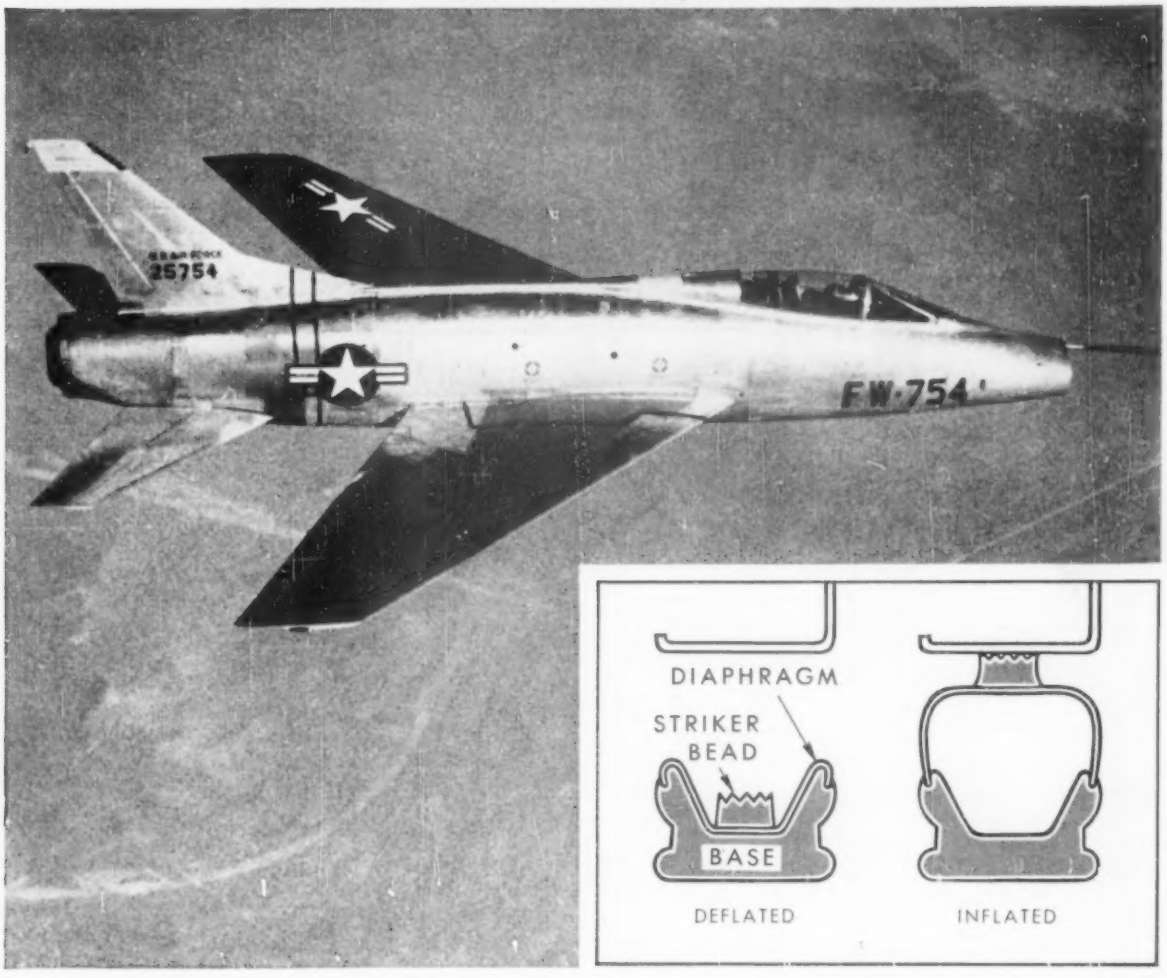


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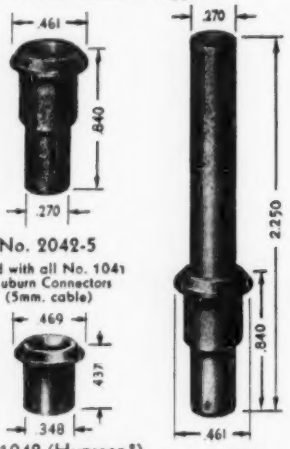


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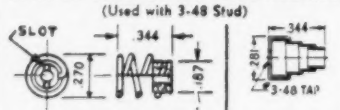


No. 1066-9A (AN 4164-22) with stainless steel coil springs

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### Teflon Connectors
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1041-TV (9/16")
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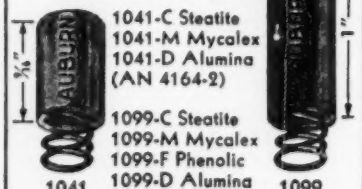


1041
1041-C Steatite
1041-M Mycalex
1041-D Alumina (AN 4164-2)

1099
1099-C Steatite
1099-M Mycalex
1099-F Phenolic
1099-D Alumina (AN 4164-1)

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# Aviation Week


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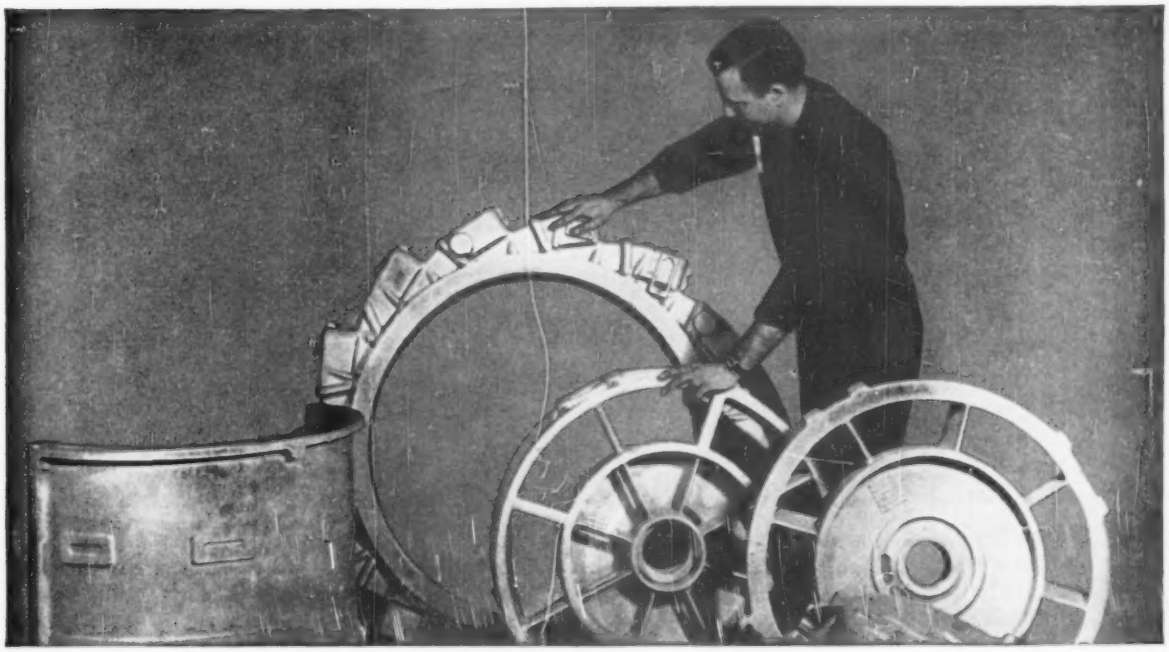

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For further information on the advantages of magnesium, contact your nearest Dow sales office or write THE DOW CHEMICAL COMPANY, *Magnesium Department*, Midland, Michigan.

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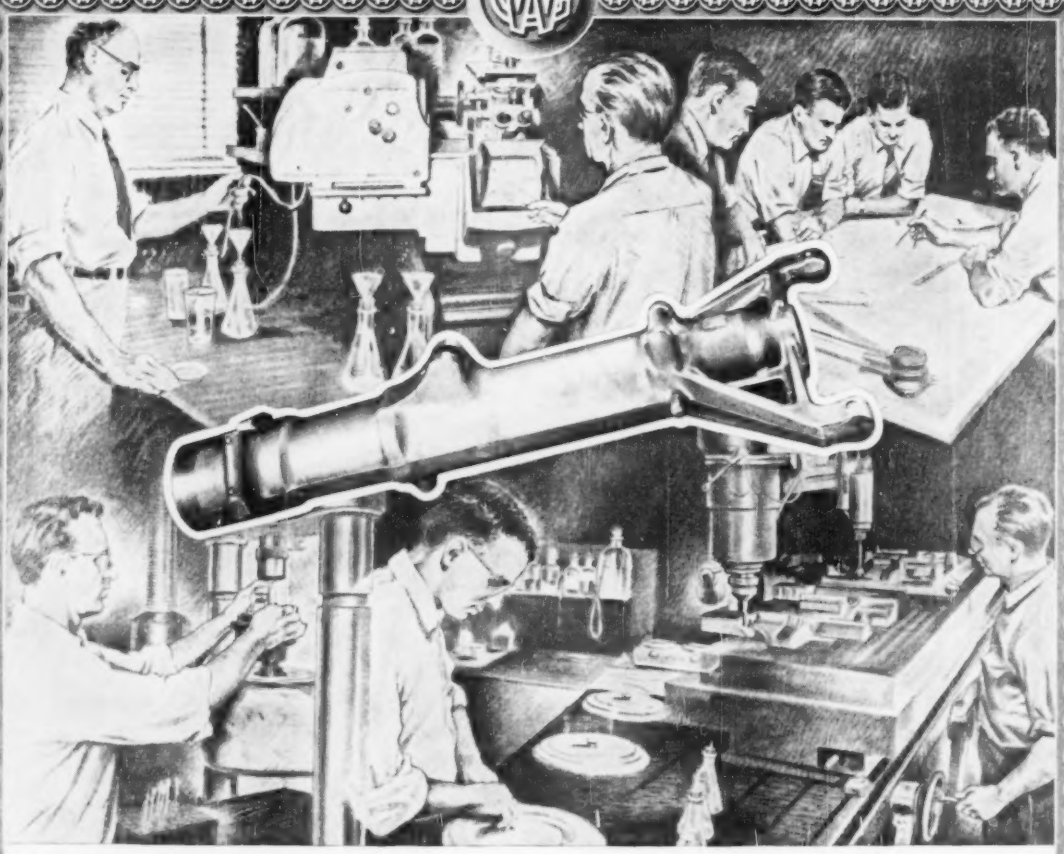

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# NEWS DIGEST

## Domestic

**Crash investigators** from Civil Aeronautics Board last week collaborated with five experts from Italy in preliminary hearings on an Italian airlines DC-6B that plunged into Jamaica Bay on the edge of New York's International Airport Dec. 18, killing 26 of the 32 persons aboard. The Rome-New York transport was making its fourth attempt to land in light rain and fog when it struck the tip of a landing-light pier, crashed and burned. Four helicopters, two Bell 47s and two Sikorsky S-55s, played a major role in the rescue work.

**Emphasis of airpower** as the backbone of U.S. armed forces was pointed up again last week by Defense Secretary Charles E. Wilson, who announced more than 400,000 men will be cut from the military while USAF will grow larger. The Air Force will grow from its present 961,000 to 970,000 by next June and 975,000 by June 30, 1956.

**Double speed record** for Miami-New York flights was set Dec. 19 by a National Airlines DC-7 tower to tower: 2 hr. 27.5 min. Block to block: 2 hr. 31 min. The transport maintained an average speed of 490 mph. and hit a maximum of 585 mph., aided by "slight" tailwinds.

**First Navy T-34B** has been delivered on schedule by Beech Aircraft Corp. at Wichita. The 173-mph. trainer, powered by a 225-hp. Continental engine, also is used at present by USAF, Canada, Chile, Colombia, El Salvador and Japan.

**Lockheed Aircraft Corp.** has received a new Navy order for 46 P2V-7 Neptunes, extending production of the hunter-killer plane into late 1956.

**Fairchild Engine & Airplane Corp.** has rolled its 1,000th C-119 cargo transport off production lines at Hagerstown, Md., and delivered the twin-engine, twin-boom Flying Boxcar to the Air Force.

**Wright Aeronautical Division** of Curtiss-Wright Corp. has received National Safety Council's award of honor for a record 4,409,864 hours without a disabling injury.

**Last T-28B trainer** produced by North American Aviation's Downey, Calif., plant has been delivered to the Navy.

## B-45 Testbed Aids J40 Jet Development

**Increasing the altitude at which the Westinghouse J40 turbojet's afterburner can be lighted is the aim of a development program involving this North American B-45A Tornado flying testbed, shown with the test-engine under its bomb-bay. The J40 flight program is being carried out at Hensley Field, Dallas, with Temco Aircraft Corp. handling data reduction and analysis plus necessary supply and other services.**

**Member airlines** of the Independent Military Air Transport Assn. have been commended by Civil Aeronautics Administrator Fred B. Lee for more than 15 months of worldwide operations without a single fatal accident.

**Test installation** of the Whitmg Loadair mechanical aircraft docking device (AVIATION WEEK Sept. 27, p. 7) has been put into service at New York's Idlewild International Airport. Approximate cost of the device plus installation: $90,000.

**Air Coordinating Committee's** technical division has failed to agree on a proposal to limit the number of antenna towers over 1,000 ft., and the problem has been referred to ACC members. Radio and television representatives have pointed out that airspace is not solely an aeronautical reservation.

**First production Air Tractor,** new agriculture biplane (AVIATION WEEK Feb. 8, p. 26), took off on its initial test flight after a 250-ft. run and climbed in excess of 1,200 ft. per min. at 60% power, reports builder Central Lamson Aircraft, Yakima, Wash.

## Financial

**International Air Transport Assn.** reports scheduled airline traffic transactions put through its clearinghouse during the first nine months of 1954 totaled $210,567,000, an increase of 18.3% over the $178,045,000 for the same period last year.

## International

**Trans-Canada Air Lines'** Super Constellation crashed and burned Dec. 17 nine miles from its destination on a flight from Tampa, Fla., to Toronto. None of the 23 persons aboard was killed.

**Shorthaul turboprop transports** are being designed by Hurel Dubois and Sncan, will be studied by a special group representing all French airlines. Both transports probably will be powered by twin Rolls-Royce Darts.

**Britain's lagging production** of turbojet-powered bombers and fighters has forced the government to consider reviving its wartime Ministry of Production Aircraft, according to press reports. Prime Minister Sir Winston Churchill says delays in deliveries to the Royal Air Force and Royal Navy are being examined.

**J. P. R. Vachon,** 56, member of Canada's three-man Air Transport Board, pioneer pilot who helped open northern air routes and winner of the McKee trophy, died Dec. 17 at Ottawa.

**Sabena Belgian Airlines** is taking the corporate name of Sabena Belgian World Airlines.

**Swedish turbojet producer,** Svenska Flygmotor AB at Trollhactan, is beginning a $4-million expansion program based primarily on a new contract signed with the Royal Swedish Air Force. RSAF is reported to be trying to supply its future needs totally within Sweden.

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## December 27, 1954

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as others see us . . .

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by WALTER M. TEMPLIN
Engineer
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# Washington Roundup

## Philadelphia for Airshow?

Philadelphia is a dark horse entry in the 1955 National Aircraft Show competition.

Louis R. Inwood, city's director of aviation, told AVIATION WEEK Philadelphia is drafting a formal invitation with an outline of its program and pledge of $50,000 from the chamber of commerce to help finance the show. Inwood and chamber officials have met with other civic leaders and Ben T. Franklin, general manager of the show, to discuss the projects.

Philadelphia has become a strong contender for the 1955 exhibit, Franklin said, because the city is ideally located in the center of the East Coast's most concentrated population area, with good travel facilities north above New York, south at least as far as Washington and west to Pittsburgh.

Inwood says Philadelphia's International Airport, where a new $1-million terminal was opened a year ago, has more ramp space available for static exhibits than any previous site used by the show. The field has four large hangars, two occupied by Piasecki Helicopter Corp., and one each by Trans World Airlines and the Air National Guard.

Inwood says he is confident that at least two and probably three of the buildings can be made available. In addition, the airport's old terminal building can be used.

Only stumbling block to airshow plans remains in the Pentagon, where a top-level decision is expected at least by mid-February. Indications are that the Secretaries of the three armed forces will discuss the question of Defense Department support for the show at meetings next month. Navy is known to oppose continuation of the show. Air Force strongly favors the exhibition.

## Support for Feeders

Campaign by local service airlines for permanent certification has gained support from CAB member Joe Adams, but the other four CAB members still oppose the movement.

Latest statements of position came in a series of letters from Adams and CAB Chairman Chan Gurney to Sen. John Bricker, chairman of the Senate Interstate and Foreign Commerce Committee, which will review legislation aimed at permanent certification.

Says Gurney: ". . . The Board continues to believe that legislation granting permanent certification to all of the existing local service carriers would be premature at this time . . . there is no showing of reversal of the unfavorable trend in subsidy needed."

Says Adams: "It is my belief . . . that the air transportation offered the smaller communities by our local service carriers is as permanent as the communities themselves."

Permanent certification suggested by Adams would have a skeleton of strong terminal points with intermediate points that could be adjusted as traffic potential is developed, thus retaining an element of flexibility in the certificates.

## Procurement Red Tape

Harassed military procurement officials, sometimes surrounded by confusion and criticism, have a justified feeling that too few people realize how many things have to be considered in making a purchase.

It is not a question of finding the best product at the lowest price, despite the political truisms that are bandied about by some of the same people who set up the hurdles for the military buyer.

In addition to being ordered to buy good products at the lowest possible cost, maintain the mobilization base with proper consideration to industrial dispersal (see page 15) the buyer has other considerations.

He is ordered to buy American, buy Canadian and buy offshore. He must police five-percenters, racial discrimination and financial responsibility. He must develop multiple sources, save critical materials, observe priorities, encourage subcontracting, avoid monopolies, help distressed areas and small business. In addition, there is mandatory procurement from the General Services Administration and the federal prisons industries.

The trouble was accurately defined last summer by Sen. Homer Ferguson (Rep., Mich.), who will not sit in the next Congress. Said he: "Congress has gotten to the point where it never repeals a law. It just adds another law on top."

## Missile Security Crumbles

Washington observers are wondering how much longer Department of Defense brass are going to delude themselves on missile security. Top-level Pentagon officials now believe adequate security is being maintained on latest missile developments simply because no official public releases are being made from its public relations paper mill.

However, Bell's Rascal air-to-ground missile has been on public view at Boeing's Seattle Airport and the Niagara Falls, N. Y., municipal airport adjoining a public highway that carries thousands of tourists to see the falls.

Northrop's Snark has been parked on a public airfield at Hawthorne, Calif., used by private pilots. Navy Adm. J. H. Sides, chief of the Guided Missiles Division of the Office of Chief of Naval Operations, recently showed movies of the Convair Terrier in action against drone targets at an unclassified meeting of the American Ordnance Assn., but Navy still bars the contractor from releasing Terrier pictures.

Now public information on the Convair Atlas, intercontinental ballistic missile, most sensitive missile project in the Pentagon arsenal, is leaking via national news magazines and daily newspapers in the San Diego area.

## Air Logistics Battle

Although top USAF brass turned out en masse for the recent air logistics conference in Washington (see p. 13), the real battle to get USAF supply off the ground and into the air is being fought within the air staff.

Some key air staff members can't unchain their logistical thinking from the massive stockpiles and creeping surface pipelines of World War II to face realistically the modern supply problem. Aircraft industry and USAF adherents of aerial logistics will be watching the fiscal 1956 budget closely to see if air transport will really get more emphasis where it counts—in the pocketbook.

Irony is that aerial logistics could eventually afford USAF and taxpayers substantial return on their initial investment by reducing procurement requirements for expensive equipment such as jet engines and avionics systems.

—Washington staff

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# WHO'S WHERE

## In the Front Office

**John A. Morgan**, onetime Air Materiel Command staff executive for procurement and production (1951-53), is new vice president of Glass Fibers, Inc., and general manager of its Western Division, Burbank, Calif.

**Ralph W. Moss**, former design engineer at Lockheed Aircraft Corp. and now vice president-sales for Haskel Seals, Inc., has taken on additional duties as sales manager of Haskel Engineering & Supply Co., Glendale, Calif.

**Abraham Krasnoff** has been appointed a vice president of Pall Filtration Co.'s Micro Metallic Corp., Glen Cove, N. Y., also will retain his position as vice president of Aircraft Porous Media, Inc.

**Ott J. Mink** has become a vice president of M. Steinthal & Co., New York parachute manufacturers.

**Robert J. Wilson**, vice president-personnel and properties for Capital Airlines, has been elected a director of New York's Central Terminal, Inc., and East Side Terminal, Inc. **George L. Wertenbaker** has returned to Capital after a USAF tour of duty, will take over his former position of assistant, vice president-traffic and sales.

## Changes

**G. E. Keck** is new assistant to United Air Lines' vice president-engineering and maintenance.

**Edward M. Bancroft** has moved up in United Aircraft Corp. to master mechanic of the Hamilton Standard Division, Windsor Locks, Conn. Also promoted: **John E. Bateman**, to chief tool engineer of HSD.

**Harold N. May** has been appointed general purchasing agent for Convair Division of General Dynamics Corp., San Diego. Other changes: **W. G. Evans**, purchasing agent; **Edward Fellows, Jr.**, purchasing services administrator.

**Dr. George L. Haller** has become manager of the laboratories department of General Electric Co.'s Electronics Division, Syracuse, N. Y.

**Myron G. Domsitz** has been named chief engineer of Simmonds Aerocessories, Inc., Tarrytown, N. Y.

## Honors and Elections

**Gregorio Obregon**, president of Avianca, executive vice president **Jorge Gonzalez** and vice president-financial **Fernando Carrizosa** have been awarded the rank of Commander in the Order of Cruz de Boyaca, highest decoration of the government of Colombia.

**William T. Piper**, president of Piper Aircraft Corp., was honored for his contributions to the aviation industry at a recent dinner given by the Aero Club of Pennsylvania in Philadelphia.

**Ruben F. Mettler**, Hughes Aircraft Co. engineer now on loan to the Defense Department, has been named the "outstanding young electrical engineer of 1954" by Eta Kappa Nu, electrical engineering honor society.

# INDUSTRY OBSERVER

► Convair F-102A flew past Mach 1 in level flight above 30,000 ft. during early stages of its flight testing at Edwards AFB last week. Convair test pilot Dick Johnson reported no buffeting encountered and good control characteristics all the way through the transonic range. F-102A has a lower gross weight and more power than the prototype models. It is powered by a new version of the P&W J57 turbojet delivering 16,000 lb. thrust with afterburner.

**► USAF expects to have the Pratt & Whitney T57 turboprop flying experimentally in about two years and operationally in about five years. T57 is aimed at producing about 15,000 ehp. and is scheduled to power the Douglas C-132 logistics carrier now being developed at Santa Monica, Calif.**

► Lockheed's F-104 day superiority fighter is being considered by Canadair for licensed production in Canada for the Royal Canadian Air Force. Previously, Canadair had been interested in production of the North American F-100 Super Sabre.

**► Navy's Sidewinder missile uses a rocket installation of three pods at the aircraft wingtip. One pod is slung below, one above and one outboard of the tip, giving a cruciform appearance from the front. This air-to-air missile system is being developed by a group of manufacturers, including the Philco Corp.**

► Avro Canada had eliminated many of the bugs that were retarding introduction of its twin-jet CF-100 into RCAF operational service, including seat ejection problems, hydraulic system troubles, communications and other problems. RCAF will get the CF-100 into widespread operational use during 1955. Avro feels there still is considerable performance growth possibilities in the CF-100 design.

**► Canadair is building a full-scale mockup of the maritime reconnaissance version of the Bristol Britannia and expects to have its first flying prototype ready for rollout by the end of 1956 or early in 1957. The British airframe will be powered by Wright Turbo Compound engines.**

► Long-sought goal of direct amplification of light without vacuum tubes has been demonstrated by General Electric Co. scientists using new transparent-film type phosphor (AVIATION WEEK Oct. 11, p. 61). Possible aviation uses of the new technique include night-time aerial reconnaissance of enemy movements using ultra-violet (black) light, display of radar and blind landing information on cockpit windshields, and brighter cockpit radar displays.

**► Use of asbestos-reinforced plastics is expected to grow in aircraft and missile applications in U. S. British are now using material in rocket nozzles because of its heat resistance and insulation qualities. Material also bonds readily with metals. Experiments show that combination of fibrous glass and asbestos is even better reinforcing medium than asbestos alone.**

► Grumman is producing a new version of the S2F anti-submarine warfare plane designated the S2F-2. Among new features included in the S2F-2 is a rotary-type bomb-bay.

**► French government has awarded a $700,000 development contract to Breguet for its new Model 940 design featuring a high-mounted wing and to be powered by two 400 hp. Turbomeca turbines. The Model 940 is designed to take off and land in 130 ft. and will have a special device controllable by the pilot to direct the jet exhausts downward during low flying speeds—probably similar to the arrangement now being flight tested by Bell Aircraft Corp. on its vertical-takeoff and landing aircraft. French government plans to invest in two prototype Model 940s if design looks promising.**

► Combat speeds of military aircraft will increase to Mach 5 and operate at altitudes of 100,000 ft. during the next 10 to 20 years, according to Col. W. A. Hotman, chief of the Tactical Weapons System Division of Air Research and Development Command.

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# Aviation Sales Outlook: $8 Billion in '55

- **AIA expects net profits to equal 1954, as deliveries and employment remain stable for fourth straight year.**
- **Forecast for new year predicts more transports and bombers will be built, missile production will increase.**

By G. J. McAllister

Aircraft industry sales of $7.9-8.1 billion are in prospect for 1955, a slight decline from the $8.6 billion in sales for 1954, Aircraft Industries Assn. predicts.

However, manufacturers can expect profits to remain above the 1953 level and to be approximately the same as in 1954 because of the expiration of the excess profits tax.

▶ **Steady Output**—This will be the fourth straight year that industry sales have reached or exceeded $8 billion, an unusually stable level of operations.

True barometer of the state of the industry—sales, pounds of airframe and employment—will remain steady, although unit production will continue to taper off gradually. Reasons:

• **Heavier aircraft,** principally in the bomber and transport category, will be built.

• **Guided missiles** are taking an increasing amount of the industry's production effort. At least 26 different models are in production or service test stage.

• **Research and development** continues at a relatively high level.

▶ **1955 Outlook**—The association also forecasts this outlook for next year:

• Employment will continue at a high level, with a 1955 average of 755,000 workers. Shortage of engineers and technicians will not diminish.

Peak aircraft employment in 1954 was 830,100. Average employment from January through September was 811,000, making the aircraft industry the nation's leading employer. The 1954 payroll was $3.5 billion, largest in the U.S., and average annual earnings were $4,414.

• Combat capability will be appreciably increased with the delivery of new high-performance models, and by the end of 1955 USAF will be 95% modernized and the Navy air arm 80%.

At the end of 1954, virtually all combat aircraft in production were jet-powered and production had started on seven supersonic fighters and one supersonic bomber. Fighters are North American's F-100, McDonnell's F-101, Convair's F-102, Lockheed's F-104, Grumman's F9F-9, Douglas' F4D and Chance Vought's F8U. Bomber is Convair's B-58.

• Revolutionary advances in aeronautical science have imposed an increasing need for modernizing research facilities and test equipment. This will create an investment requirement for this type equipment during 1955, although production plants virtually have been completed.

• Civil aircraft manufacturers at year's end had unfilled orders for 175 large commercial planes and are expected to continue their leadership in the world civil aircraft market. During 1954, U.S. manufacturers delivered 325 planes of which 195 were 36-passenger or larger types and 130 were twin-engine executive planes.

• Unit production of utility aircraft in 1955 will be approximately the same as last year. Sales for 1954 are estimated at $40 million, an increase from 1953 sales of $34.5 million, and an increase in airframe weight from the 1953 total of 10.8 million lb. to 12.5 million in 1954. This is the result of new twin-engine aircraft being offered in quantity for the first time in 1954.

• Production of helicopters for commercial use is expected to increase in 1955, following steady increases made in 1954.

▶ **Transition Period**—Sales volume during 1954 of the 12 largest airframe manufacturers was about $5.3 billion, highest since World War II. Sales by these companies in 1955 are expected to approximate the 1954 record.

The end of 1954 marked the transition from the buildup to the maintenance and modernization phase of the nation's air remobilization program. However, production of airframe weight in 1954 remained about the same as in 1953—about 150 million lb.

AIA predicts that production of military aircraft for 1955 will be about 10,000 planes. Military deliveries represent about 90% of the total industry effort.

Aircraft industry during 1954 was able to place an increasing emphasis on improving manufacturing techniques and cost-reduction efforts.

Prime example of improving the quality and reliability of products is in jet engines where substantial reductions in requirements became possible through increases of time between overhauls.

## Military Production

Production of military aircraft since the start of the Korean war in June 1950 is estimated by AIA at 37,500 to 37,800 units.

Estimates by years:

1950—Less than 3,000*
1951—More than 5,000
1952—9,000
1953—11,500
1954—10,500 to 10,800

* 1,500 built after June 1950.

# NAA Profit Exceeds $22 Million

Record postwar profit of $22,179,736 was reported by North American Aviation, Inc., for its fiscal year ended Sept. 30, 1954. The NAA report is a bellwether on the effect of expiration of excess profits taxes on 1954 profits.

North American realized its record $22-million profit on sales of $648,834,341, slightly higher than the 1953 sales of $636,537,658 that yielded only $12-million profit because of the excess profits tax. The company earned the equivalent of $6.46 per share for 1954, compared with $3.72 in 1953.

▶ **$1.3-Billion Backlog**—Lee Atwood, corporation president, predicted North American's sales would continue at about the 1954 level through next year. Backlog of $1,372 million now is on the corporation books, compared with $958 million at the beginning of 1954.

NAA passed its World War II peak in floor space during the year, using 9,128,000 sq. ft. compared with 8,574,000 sq. ft. at the wartime peak.

However, the corporation plans to invest $8.8 million in additional facilities during 1955 to meet increased de-

velopment and production loads. Among the new facilities planned: a precision machine shop, nuclear development facility, new general offices and additions to the supersonic windtunnel. Total of $6 million was spent for new facilities in 1954.

Employment mounted to a record total of 54,930 at the end of fiscal 1954.

▶ **Expanding Interests**—The North American annual report gives a clear picture of the monolithic character of the firm's expanding activities that have changed it from primarily an airframe manufacturer into an industrial giant with substantial interests in electronics, rocket propulsion, nuclear energy and guided missiles.

Airframe production still accounts for the major portion of its total sales, of which 98% are to agencies of the federal government.

North American's airframe production is distributed as follows among four divisions:

• **Los Angeles** produced F-86F fighters, F-86D all-weather interceptors and F-100 Super Sabre day fighters for USAF; will produce two new versions of the F-100 series in 1955, including a fighter-bomber configuration and an all-weather interceptor.

• **Columbus** produced FJ-2 and FJ-3 carrier-based Navy fighters, AJ-2 and AJ-2P carrier-based bombers, and F-86F and F-86H fighter-bombers for USAF. During 1955, F-100 production will begin here, and the Navy's T-28B trainer program will be transferred from Downey.

FJ-4, the first major design project of this division, will go into production during 1955 for Navy.

• **Downey** produced T-28 trainers for USAF and Navy and housed development facilities for missile, nuclear and electronic work.

• **Fresno** completed T-6G modification program and began modification programs on F-86 fighters and F-86D all-weather interceptors.

In addition to the two new versions of the F-100 series, North American also expects to revive F-86F production for USAF and is pushing the sale of a two-place trainer version of the F-86 to both USAF and Navy.

Guided missile and guidance control equipment programs at the Downey Division continued to expand during 1954, and a number of these projects shifted from development to manufacturing phase.

NAA reported new contracts received for development of both missile and aircraft guidance systems, a phase of the corporation's expanding activities that has drawn criticism from avionics manufacturers already established in this field.

▶ **Rocket Contracts**—North American's venture into rocket propulsion is beginning to pay off with the receipt of contracts for large rocket motors for missiles to be manufactured by another company.

Presumably, this means North American has at least part of the propulsion contract for Convair's Atlas missile since this is the only current requirement for the huge rocket power outputs developed by North American Aviation.

USAF is financing a new rocket propulsion development center to be operated by NAA, located in the San Fernando Valley approximately 10 mi. from the company's present test facilities in the Santa Susana Mountains. This 322,000-sq.-ft. facility is expected to be completed during the course of 1955.

▶ **Nuclear Program**—North American also will build a new nuclear development center in the San Fernando Valley and transfer this program there from the Downey Division.

The company is building an experimental sodium-graphite nuclear reactor at Santa Susana and expects to have it operating by 1956.

This is part of a $10-million program to develop industrial power sources from nuclear energy. NAA also has other Atomic Energy Commission research contracts.

▶ **Subcontract Change**—North American reported a major shift in the character of its subcontracting activities during 1954 that probably presages a general change in the business relationships of prime weapons system contractors with their subcontracting and suppliers' network.

NAA says it has cut down substantially on the volume of airframe subassembly work given to subcontractors but that it is increasing the volume of machined parts work placed with outside firms.

"The trend toward more machining in modern aircraft has made it impractical for the company's buildup in machining capacity to keep pace with schedule requirements and has led to greater emphasis upon subcontracting in this category," the North American report said.

NAA reported purchase orders totaling $253 million placed with approximately 10,000 firms during the year 1954.

## Gains in 1954

| | 1954 | 1953 |
|---|---|---|
| Net income | $22,179,736 | $12,773,361 |
| Sales | 648,834,341 | 636,537,658 |
| Earnings per share | 6.46 | 3.72 |
| Backlog | 1,174,000,000 | 958,000,000 |

# Air Logistics

**• Experts cite combat need for aerial supply system.**

**• Military, civil spokesmen outline major problems.**

By Robert B. Hotz

Acute need for a global aerial logistics system to support USAF, Army and Navy combat units was outlined by top spokesmen for the military, airlines and airframe manufacturers at an air logistics conference in Washington sponsored by the Air Force Assn.

Among the principal problems cited in development of the system:

• Shift in military logistics practice to airlifts as a primary method of transportation for certain critical materiel rather than as an emergency stopgap.

• Development of 500-mph. transports capable of carrying 100,000-lb. payloads over 3,500-mi. range.

• Development of high-powered turboprop engines that will make the long-range, highspeed heavy logistics transport possible.

• Integration of the capacity of the civil airlines fleet into a permanent peacetime military aerial logistics system.

• Development of the aerial logistics system during peacetime so that it is in being and operational when required to support combat in atomic warfare.

## Talbott Reports

USAF will take another major step in establishing an aerial logistics system next spring with the inauguration of airlift of all aircraft engines required by its overseas forces, USAF Secretary Harold Talbott told the conference.

Talbott said USAF planned to use commercial aircraft operated by civilian crews to augment military airlift on this project (AVIATION WEEK Aug. 16, p. 140).

▶ **Overhaul Cycle**—"This project provides a good example of the savings that can be made by the use of air transportation," Talbott said. "We estimate that the time of the engine overhaul cycle will be reduced from 270 days now required by surface transportation to only 100 days by air transportation.

"We also estimate our overall engine requirements will be reduced by about 25% by this operation. A 25% reduction in engine requirements amounts to a good many millions of dollars when we remember that a single J65 costs about $75,000, a J47 about $50,000 and an R4360 piston engine about $78,000."

▶ **'Efficient, Economic'**—Talbott said the backbone of the air logistics trans-

port fleet will be an aircraft capable of carrying a 100,000-lb. payload over trans-Atlantic ranges nonstop to operate directly from U. S. supply bases to overseas air bases.

He said a transport of this capacity is being developed—presumably referring to the Douglas C-132 powered by Pratt & Whitney T57 turboprops. He also said USAF is developing a 25-ton payload transport, presumably the Douglas C-133 powered by Pratt & Whitney T34 turboprops—due to fly next spring.

The cost of operating both the C-132 and C-133 nonstop across the Atlantic will be "efficient and economic" when compared with the overall cost of surface transportation, Talbott said. He urged the development and production of turboprop engines be expedited to utilize the best gas turbine design features embodied in modern turbojet engines.

▶ **Flexible, Fast**—Talbott emphasized that the USAF aerial logistics system was not designed solely for its own use but must be organized on a scale to handle the transport requirements of the Army and Navy.

"The goal of our modern air logistics system is to provide a system so flexible and fast that it will react to the requirements of our field commanders overseas as well as in this country in a matter of hours—rather than the present 100 days," Talbott said.

"The system must be placed in operation during peacetime—and as soon as possible. Unless an air logistic system is in being on a 'D' day, we could not shift to it and build it up in the rush of wartime priorities without disastrous delays. We need the inherent savings of the system."

## Twining Warns

"An aerial logistics system must be developed to meet the threat of enemy attack on surface transportation," Gen. Nathan F. Twining, USAF Chief of Staff, told the conference.

"Our studies indicate that modern weapons, particularly when combined with a surprise attack, constitute a greater threat to surface transportation systems than to air systems. This is particularly true of massive port installations and the long time of surface transport . . . exposure to the possibility of enemy attack.

"During World War II, the Air Force learned in the hard school of experience, the necessity for an air logistics system to support air warfare."

▶ **600-Mph. Pace**—Twining cited the combat mobility now being achieved by both Strategic Air Command and Tactical Air Command units in shifting their bases of operations across intercontinental ranges at speeds of 600 mph. and emphasized that logistics must move at close to that pace or be useless to support combat operations.

"The combination of combat mobility and logistics flexibility are inseparable," Twining said. "We must have them both."

Twining said the current 50-million ton-mile per month capacity of Military Air Transport Service was grossly inadequate to meet air logistic requirements.

"Our immediate objective is to increase USAF airlift capability by 50% in the next three to five years. In the succeeding five years our goal is double or triple our present capability."

## Douglas Forecasts

Donald Douglas, president of Douglas Aircraft Co., a leading U. S. transport manufacturer, told the conference a fleet of only nine new type heavy air transports could do the work of a fleet of 171 C-54s or 58 C-124s at a cost of 25% to 33% less and in less than half the time required for the older models.

▶ **New Transport Family**—Douglas described the new logistics carrier as a transport grossing about 400,000 lb. carrying a 100,000-lb. payload and cruising at about 500 mph. over ranges from 1,500 to 3,500 nautical miles.

These specifications are roughly similar to those of the C-132. Douglas said this type transport would have a direct operating cost of 3½ cents per ton-mile (nautical).

A family of new-type transports, including both turboprop and turbojet-powered aircraft, are required for an aerial logistics system, Douglas said. He noted that turbojet transports are required for specialized jobs such as aerial refueling and, if properly designed, they can have operating costs well below current standards when used for passenger or cargo operations.

▶ **Realistic Depreciation** — Douglas called for a revision of the present policy governing prewar second-line transport aircraft to establish a modern depreciation policy for transport aircraft and make possible a realistic cost comparison between air and surface movement of cargo.

## C. R. Smith Recommends

C. R. Smith, president of American Airlines and World War II deputy commander of the Air Transport Command, recommended better methods of cooperation between USAF and the airlines to provide the most economical air transportation for an aerial logistics system.

▶ **Basic Specifications**—He said the present civil air fleet was obsolete for modern military requirements and must be replaced by more efficient equipment to provide a substantial portion of the military reserve transport capacity for emergency use.

He recommended that common basic specifications be developed for aircraft and their equipment to be used by civil airlines and earmarked for emergency military duty.

▶ **Powerplant Lack**—The most serious deficiency in modern air transport development, he said, is lack of an efficient powerplant.

"There is not a turboprop engine of modern design in production in our country today," Smith said. "Today our choice is between the reciprocating engine and the turbojet engine, and that may be an untenable position for both the Air Force and the airlines."

# Lockheed, Convair Sign Labor Contracts

**Los Angeles**—Lockheed Aircraft Corp. and Convair Division of General Dynamics Corp. signed new labor contracts last week, guaranteeing more than a year of peace for the West Coast aircraft industry.

The two companies were the last of the big West Coast aircraft builders to negotiate agreements with labor unions (AVIATION WEEK Dec. 20, p. 14).

For the most part, the agreements this year were negotiated "smoothly," a local labor leader reports. He says the spirit of cooperation between labor and management can be attributed to a general strengthening of local labor unions and to the newly elected Democratic Senate.

▶ **8-Cent Increase**—The new contract at Lockheed, calling for wage increases of 5, 6 and 7 cents an hour, was "overwhelmingly" accepted by members of the International Association of Machinists (AFL) Lodge 727. The contract is for 14 months and expires Feb. 15, 1956.

In addition to pay raises, provisions include an increase from $4,000 to $5,000 double-indemnity life insurance, death and disability policies and a boost in nonoccupational disability payment from $35 to $40 weekly.

The company reports actual pay increase together with new fringe benefits will amount to about 8 cents an hour for approximately 19,000 workers at Burbank and Palmdale.

▶ **'No Trouble'**—Convair and IAM Lodge 1125 reached agreement on a contract providing wage increases and other benefits for 15,000 hourly paid employes at San Diego.

The contract was to have been presented to union membership for ratification Dec. 26. Union leaders were quoted as "not expecting any trouble" in acceptance.

# Wilson's Aim: Plant Dispersion

**New procurement directive reflects nature of H-war, is no reversal in buying policy, Defense chief says.**

Defense Secretary Charles E. Wilson last week denied that his new directive ordering revision of military procurement regulations to strengthen the nation's mobilization base is a reversal in policy (AVIATION WEEK Dec. 20, p. 12).

Breaking a 12-day freeze forbidding Pentagon procurement officials to discuss the directive publicly, the Secretary said the purpose of the order is to put new emphasis on industrial dispersion made necessary by the nature of thermonuclear war.

▶**Mobilization Factor**—The directive is not a change in policy, he said, because military buyers never have been forbidden to pay premium prices in order to maintain this kind of industrial mobilization base.

Explaining the directive that resulted in wide speculation and confusion since it was released on Dec. 8, Wilson referred to a memorandum issued by Gen. George C. Marshall, then Secretary of Defense, in December 1950.

The Marshall directive cited a national emergency then in existence and called on the armed forces to spread contracts as widely as possible, even though it would require wider use of negotiated business and a curtailment of formal advertising.

Wilson declared the Marshall order never was rescinded and the basic policy never changed. He said it "recognized the problem of dispersion, but we think that it's a little more important now. . . . The Marshall directive was essentially a buildup of industrial capacity, and it didn't have much in it on how you maintained that mobilization capacity when the orders started to run out."

The Secretary added that his new directive is in many respects an implementation of instructions from the Office of Defense Mobilization.

▶**970 Essential Items**—Wilson was assisted at his press conference on the mobilization base by Robert C. Lanphier, Jr., Deputy Assistant Secretary for Supply and Logistics.

Lanphier was questioned about mention of the preferential planning list in the new directive. He said there is some misconception that it is a list of suppliers.

He gave this definition of the list: ". . . Items which are considered the most critical and essential to the military machine. It amounts to some 970 items at the present time that take a long lead time and are hard to make and are critical to the military establishment.

"That list has been in existence for some time and is actively maintained as weapons come or go or their importance changes," he added. "It constitutes what amounts to about 70 or 75% of the dollar procurement of military weapons systems." The items can be end items or components.

The list, Lanphier said, is confidential.

▶**Planning Basis**—Inquiry at the Pentagon later, when procurement officials believed the freeze on information had been thawed by the Wilson press conference, revealed that the preferential planning list has been completed but still not distributed to the armed forces. Publication is imminent.

Once the list is in the hands of military procurement officers, they will have a basis for integrating procurement with mobilization planning. A contractor who wants to be considered for orders of items on the list can do so only by starting at the bottom: He must get his company on the Defense Department's list of planned wartime materiel suppliers.

How can he do this? By going directly to the branch of the armed forces that buys an item he can make. He then must sell the procurement officer on the ability of his company to perform and get his firm in a position where the military will consider his plant in mobilization planning.

From this stage, a successful firm will get a "phantom order"—a spot on the tentative mobilization production schedule. This is a list of specific items and who will make them in case of war. It exists to cut down on the time lost getting into production on M-day.

▶**Procurement Omelet**—In emphasizing that the new Wilson directive does not mark a change in policy, it was pointed out that smart procurement demands that the wheels be kept turning in the plants of the planned suppliers whenever possible. It may be that some of these are not the lowest-cost producer. In fact, the most efficient producer in peacetime may not be able to handle a wartime order because of its size.

"It's a lot like an omelet," a procurement expert explained. "If I need a six-egg omelet today and may need a 6,000-egg omelet next month, shall I hire a short-order cook on the basis of today's appetite or give the six-egg order to the Mayflower Hotel kitchen because the chef there can make a 6,000-egg omelet?

"The Mayflower is inefficient on a six-egg omelet. The short-order cook can't break 6,000 eggs."

▶**'Hot Lines'**—Wilson was just as emphatic in his declaration that cases will have to be handled on an individual basis, case by case, and that the fundamental policy is unchanged.

The Secretary said military buyers always have been free to accept bids or negotiate contracts with other than lowest-cost producers if conditions warrant. He said there may be cases where an order will be divided among three producers and actually be for uneconomical quantities to maintain "hot lines" instead of "cold lines."

"And how much does it cost you?" Wilson said. "How much does it cost if you put one of them in mothballs and run the other two? What is the best thing for the country?" He said these decisions are vital to proper maintenance of the mobilization base.

Wilson made it clear that the Pentagon will review all purchases made from other than the lowest-cost producers "about every 90 days" because "different situations will develop on different items."

▶**Buyers' Problems**—The Secretary indicated that some Pentagon sources were correct a week earlier when they speculated that the new directive was designed to ease the problems of those military buyers who find it necessary to purchase from other than lowest-cost producers. Facing possible criticism for paying a higher price, they have been in need of a more concrete directive on which they can base the decision in what Wilson called a "different situation."

Wilson said money for developing the mobilization base is included in his 1956 budget that goes to Congress next month.

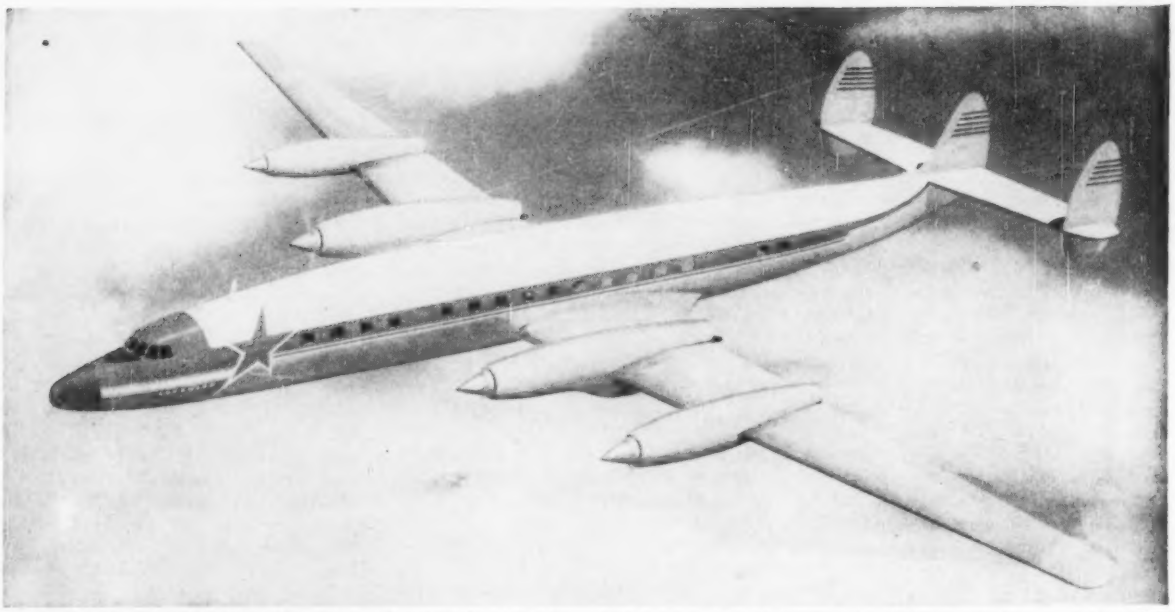
"Just how much I can't tell you," he said, "because we have enough flexibility in procurement in most of the services."

It appeared last week that some of the confusion touched off by the directive will persist. Some procurement officials in the Pentagon frankly said they felt the department had bungled the approach to industry by making the directive public without immediate explanation.

# Washington to Get $2-Million Air Center

National Aeronautic Assn. plans to build a $2-million, eight-story aviation center in Washington. Tom Lanphier, NAA president, told AVIATION WEEK the structure is scheduled for completion in the fall of 1956.

The top five floors of the center will be occupied by offices of NAA, aircraft firms and aviation trade associations. Lower three floors will be devoted to clubrooms probably operated by the Washington Aviation Club, which will give up its present facilities.



**TURBOPROP-POWERED LOCKHEED** Super Constellation (artist's version) has new thin highspeed wing, 27 ft. longer than present model.

***If It Gets Orders Now for Airline Turboprops . . .***

# Lockheed Can Deliver L-1449s in 1957

Burbank, Calif.—First airline delivery of Lockheed Aircraft Corp.'s new L-1449 turboprop Super Constellation is expected to be in January 1957, if orders are received.

Prototype of the Super Connie powered by four Pratt & Whitney PT2 turboprop engines is programmed to fly in August 1956. It is understood Lockheed will turn out no prototype as such but the first three production aircraft off the assembly line will be used as test airplanes, much as Douglas Aircraft Co. did with its DC-7s.

CAA certification is expected in March 1957, following first delivery with an X-license in January.

▶**Pressure Tests**—Lockheed also will build a static test aircraft as well as one for pressure tests to destruction similar to those carried out on the British Comet.

The Burbank firm probably will not run the pressurization tests in an underwater tank as the British did but will do its testing in the Mojave Desert near Palmdale, Calif., with a retaining wall built around the aircraft to protect against structural failure.

"We do not expect any problems whatever of that type," says a company spokesman, "but of course the aircraft will be analyzed on the basis of the Comet studies."

The L-1449 is designed to operate at 30,000 ft.

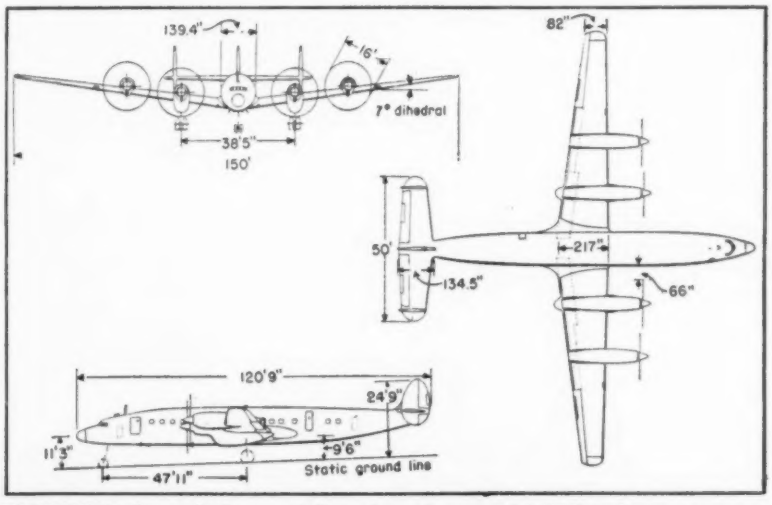
The Lockheed schedule is believed to call for production of 44 to 50 of the 1449s by the end of 1957. The company will not halt production of the conventional 1049G Super Constellation and sales of that aircraft are continuing. Separate tooling will be produced for the 1449 and the two aircraft will be turned out simultaneously on separate final assembly lines.

▶**DC-7C Competitor**—Announcement of the new turboprop aircraft has not slowed Lockheed's jet transport studies, which are continuing.

"This is not offered as a substitute for the jet transport," says Leonard Schwartz, Lockheed's director of commercial sales.

The new turboprop airliner is considered Lockheed's answer to the challenge laid down by both the Douglas DC-7C with its Wright Turbo Compound engines, and the DC-7D, which may be powered by Rolls-Royce R.B. 109 turboprop powerplants.

With its long range and a cruising speed above 420 mph., the new turbo-




**THREE-VIEW** shows planform and dimensions of proposed L-1449 turboprop transport.

## TWA Dilemma: Turboprops or Jets?

Howard Hughes, majority stockholder of Trans World Airlines, still is deliberating whether TWA will order any of the Lockheed 1449s, an authoritative source informs Aviation Week. It was indicated that no decision is expected immediately.

Hughes is understood to be worried about how soon Boeing 707 jet transports could be put into transcontinental and trans-Atlantic service by TWA's competitors, if he buys the turboprop Super Constellations now.

Hughes knows he would have top priority on Lockheed's new line if the L-1449 goes into production, and he is inclined to doubt that Boeing can meet the delivery dates it is announcing. But he is said to be gathering more data on the 707 before making any decision for new highspeed equipment for TWA.

It was industry opinion last week that if the 1449 is not ordered by TWA, which would need about 35 ships, the plane probably would not be built at all.

Meanwhile, other industry observers said they doubt if any longrange turboprop or jet transports would be ordered by any airline until the Air Force decides which U. S. manufacturers will receive its impending military contracts for more jet tankers.

Boeing already has received one such order that enables it to be the first American company to pledge deliveries of commercial versions. Obviously, its commercial transport position will be enhanced again if it alone receives the additional military orders.

Any other company—such as Lockheed or Douglas—also will be in commercial business if either or both win the USAF orders for jet tankers anticipated in the near future.

prop transport is expected by Lockheed to offer superior performance to both the 7C and 7D.

"Using only normal wing fuel capacity," says the Burbank firm, "the Super Constellation turboprop can fly a distance greater than that of any contemporary turbojet or turboprop transport and corresponding to the ultimate range of any expected longrange transport—with a far greater payload."

With the turboprop engines providing 60% more takeoff power, Lockheed says fuel costs per mile will be 15% lower than "the latest commercial airliner now in service" or, in other words, the DC-7.

▶**Airline Interest**—Announcement of the new Lockheed entry, together with the dispatch of sales teams on a worldwide campaign, has brought the airline competition between both American and British aircraft manufacturers to a new pitch.

A number of airlines, including some already committed to the DC-7C, are known to be taking a close look at the Lockheed proposal.

On the basis of announced figures for the 1449, which Lockheed believes to be on the conservative side, the new turboprop airliner not only would top the announced performance of the DC-7C but also offer a considerable speed edge over the DC-7D although the latter would be comparable in range and economics. That, of course, would depend upon the engine used on the 7D.

Lockheed anticipates that the 1449 will have a lower seat-mile cost than the 7C.

The Douglas Seven Seas will be available to airlines a year earlier than the new Lockheed aircraft, however. Pan American World Airways expects to put the 7C into service in the summer of 1956, with Trans World Airlines hoping to start operations with the 1449 in the summer of 1957, if it goes ahead with an order.

Price tag on the 1449 will be $2,650,000, compared to $2,250,000 for the 7C.

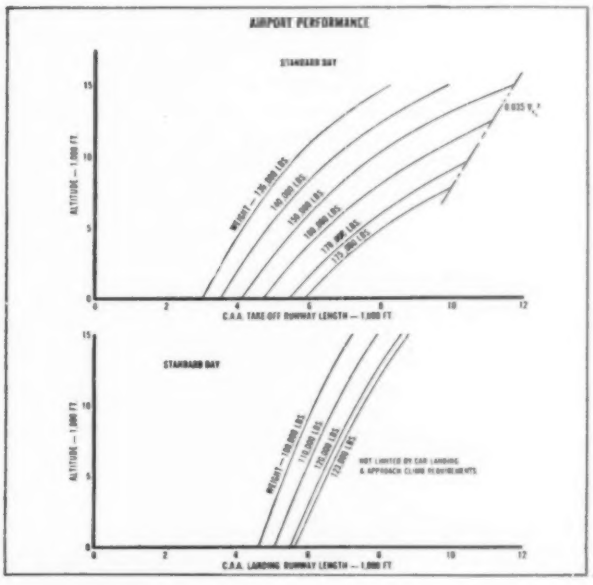
▶**DC-7's Stretch**—Douglas, of course, has further "stretch" left in the DC-7 series as one answer to the Lockheed proposal.

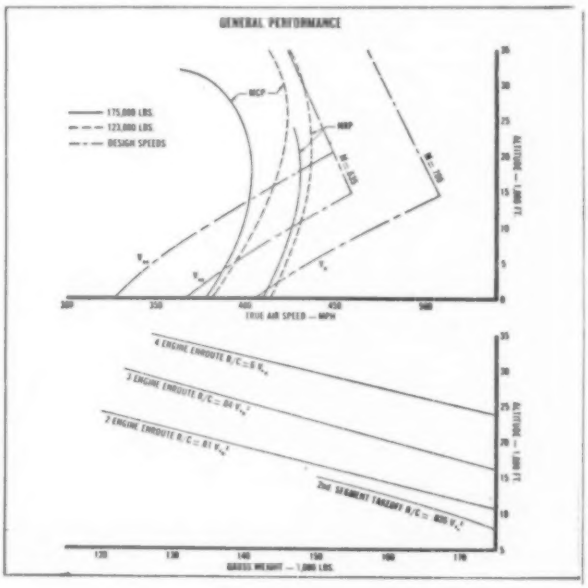
Now on the drawing boards at Santa Monica is a thin-wing version of the DC-7 designed for an unspecified turboprop engine that would cruise at 425 mph. with 110 passengers. Engines for this might be commercial versions of the Pratt & Whitney T52, Allison T56 or Bristol B.E. 25.

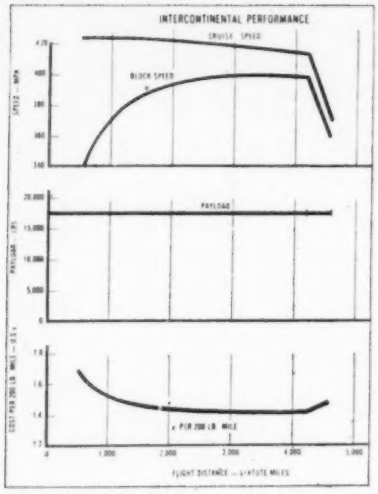
The DC-7D with the R.B. 109 would cruise at about 385 to 390 mph.

▶**Simple Turboprop**—The new Lockheed aircraft could take any of the turboprop engines mentioned above, once they have been proved. The company selected the PT-2 because it is a simple and unsophisticated single-spool turboprop that has been under development for years.

"This is the engine for '57," says a Lockheed representative. The company also looked seriously at the T56, it is reported, but found it would not be available until a year later than the PT-2. There will be improvements


AIRPORT PERFORMANCE
STANDARD DAY
ALTITUDE — 1,000 FT.
C.A.A. TAKE OFF RUNWAY LENGTH — 1,000 FT
STANDARD DAY
ALTITUDE — 1,000 FT.
C.A.A. LANDING RUNWAY LENGTH — 1,000 FT






made in the turbine section and the gear ratio. A 12% improvement is forecast in its economic curves as a result.

▶**PT-2 Highlights**—Features of the 6,000-eshp. turboprop engine are listed as:

• **Steel construction** with the entire engine, except the reduction gear housing, made of corrosion-resistant steel alloy.

• **Simplicity** resulting from single-unit design with solid compressor-turbine assembly.

• **Low operating temperatures that** eliminate the need for complicated internal cooling of turbine blades and vanes.

• **Reduction gear ratio** that keeps the propeller tips in the subsonic range at all times.

• **Anti-icing provisions** with hot compressor discharge air piped through hollow inlet guide vanes and struts at the air intake.

• **High energy** capacitor-type ignition system that makes inflight starts easier.

• **Semi-annular combustion chamber** divided into eight segments, each with a dual-orifice fuel nozzle.

• **Engine safety brake** that prevents feathered engine and propeller rotation.

• **More than double** horsepower per pound of weight.

Lockheed expects these engines, mounted on a new thin wing, to push its re-designed Super Constellation to a block speed 75 mph. faster than "any current or forecast piston engine commercial transport" (DC-7C) and 30 mph. faster than "any projected propeller-driven, longrange, commercial transport" (DC-7D).

The 1449 features a simplified four-tank fuel system with single-point underwing refueling. All fuel is carried within the wing and no tip tanks are planned at the moment.

For other features of the new airliner, see AVIATION WEEK Dec. 6 (p. 17).

# Trippe Outlines Air Role in Cold War

Vital role of U.S. aviation in winning underdeveloped countries as allies of the Free World was described by Juan T. Trippe, president of Pan American World Airways, at Washington's Aero Club Wright dinner.

"It is simple economics that a country cannot develop unless it has a proper transportation system," Trippe said. He added that many under-developed countries cannot wait for railroad and highway systems to be developed.

▶**Aviation Opportunity**—"Geographical or political conditions force them to skip these earlier stages," he said, "and enter directly into the age of flight.

"Expanding and improving the internal transportation systems of present-day under-developed countries represents a great opportunity for American aviation to be of service. Its capital and know-how in partnership with local investors, and supported by appropriate medium-term credits beyond the usual capabilities of commercial banks, can measurably strengthen the countries we wish to be our friends."

▶**Wright Day**—Other Wright celebration activities included:

• **Collier Trophy** was presented by President Eisenhower to James H. Kindelberger, board chairman of North American Aviation, Inc., and Edward H. Heinemann, chief engineer of the El Segundo Division of Douglas Aircraft Co. (AVIATION WEEK Dec. 13, p. 18).

• **Wright Brothers Memorial Award** was presented to Dr. Theodore Von Karman by the National Aeronautic Assn. (AVIATION WEEK Dec. 6, p. 7).

• **Bo Lundberg,** director of Sweden's Aeronautical Research Institute, delivered the Wright Brothers Lecture on fatigue problems of aircraft.

• **Dr. John H. Furbay,** director of Air World Education for Trans World Airlines, was awarded the Brewer Trophy for aviation education activities throughout the world.

At a luncheon preceding the Wright dinner, the following were awarded the Compte de la Vaulx medal by the Federation Aeronautique Internationale for speed records:

• **Brig. Gen. J. Stanley Holtonor,** USAF, for a 100-km. closed-course record of 690.1 mph. in a North American F-86D.

• **Robert O. Rahn,** Douglas test pilot, for a 100-km. closed-course record of 728.1 mph. in an F4D.

• **Col. William F. Barnes,** USAF, for a 3-km. straight-away record of 715.745 mph. in an F-86D.

• **Lt. Cmdr. James B. Verdin,** USN, for a 3-km. straight-away record of 752.943 mph. in an F4D.

• **Lt. Col. Frank K. Everest, Jr.,** USAF, for a 15-km. straight-away record of 755.149 mph. in a North American YF-100A. Col. Everest is the current holder of the absolute world speed record.

The Bleriot medal was awarded to William D. Thompson, Jr., Cessna Aircraft Co. test pilot, for establishment of a world's altitude record of 37,063 ft. in a lightweight aircraft (one weighing less than 2,204 lb.).

Altitude flight was made in a turboprop-powered Cessna XL-19B. The plane was powered by a Boeing 502-8 engine.

# Hunsaker, Crawford Appointed to NACA

Dr. Jerome C. Hunsaker of Massachusetts Institute of Technology, and Frederick C. Crawford, chairman of the board of Thompson Products, Inc., have been appointed to five-year terms on the National Advisory Committee for Aeronautics.

Hunsaker, a member of NACA since 1938 and its chairman since 1941, was reappointed. Both appointments, by the President, date from Dec. 1 of this year.

▶**Navy Plane Designer**—A graduate of the Naval Academy, Dr. Hunsaker has been identified with aviation since 1913, when he was detailed to Europe for a year's study of aeronautical progress there.

The following year Hunsaker set up MIT's Department of Aeronautical Engineering.

From 1916 to 1926, when he left the service, he directed the design of every naval aircraft constructed. Most notable among these were the NC-type flying boats. From 1926 to 1933 he was associated with Bell Telephone Laboratories and then Goodyear-Zeppelin Co.

In 1933 Hunsaker was named head of the Departments of Mechanical Engineering and Aeronautical Engineering at MIT.

He is a director of numerous companies, including the McGraw-Hill Publishing Co.

▶**Air Foundation Chief**—An electrical engineer trained at Harvard University, Crawford has been with Thompson Products since 1916. He is head of the Air Foundation, which sponsored the National Air Races until 1949 and since has sponsored the National Aircraft Show.

Crawford is active in the affairs of the National Aeronautic Assn. and was responsible for Thompson Products' support of Ramo-Wooldridge.

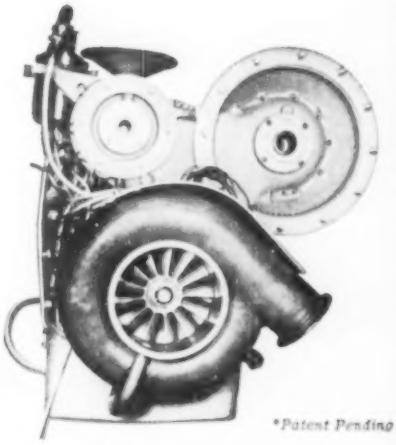
# Bleed Air Requirement

Of particular interest is the way the twin turbine configuration of Hydro-Aire's new Frijadrive System allows the individual optimizing of the refrigeration turbine while tailoring the other turbine to best performance throughout the power requirement range. By utilizing two turbines instead of one, optimum design for refrigeration needs is not compromised for variable power outputs.

▶ **Works both ways:** Conversely, additional power demand is not penalized by energy losses from: (1) loss through Heat Exchanger (only the refrigeration turbine is coupled to the Heat Exchanger); (2) increased back pressure from cabin (power turbine exhaust goes overboard).

▶ **Net efficiency increased:** The advantages, in both weight saved and lower demands on bleed air, are obvious. "We believe Hydro-Aire has made another remarkable contribution to turbine application," states H. H. Rhoads, President.

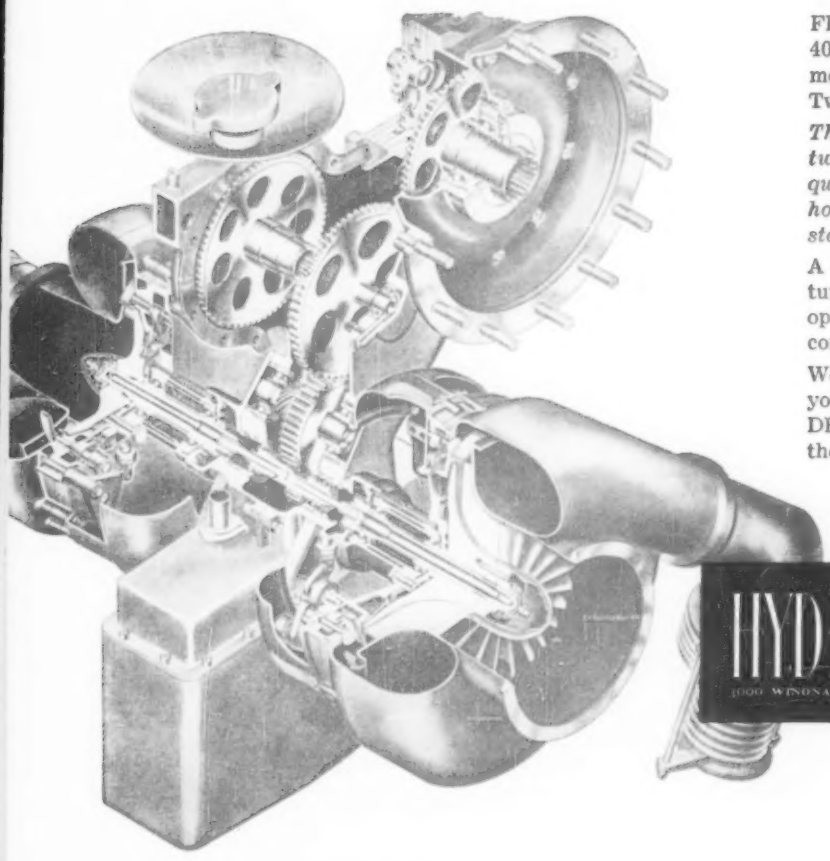

*"Twin Turbine Teamwork"*
*–a New Principle*
*in the ATM Field!*



# Frijadrive*

*Patent Pending

**A SINGLE PACKAGE, COMBINING AIR CONDITIONING AND ACCESSORY DRIVE FUNCTIONS**



FRIJADRIVE offers weight savings of 20% to 40% and saves up to 50% in bleed air requirements. It is based on an entirely new principle: Twin Turbine Teamwork.

*This principle provides speed control within two-tenths of one percent. Accessory power requirements can vary from zero to maximum horsepower. At the same time it supplies a constant air conditioning flow to the cabin.*

A control system compensates each of the two turbines as required, thus automatically giving optimum efficiency at all times for both air-conditioning and accessory-drive functions.

We'll be most happy to meet with you and show you exactly how it's done . . . and what FRIJADRIVE can do for YOU. Call, wire or write for the complete story NOW.

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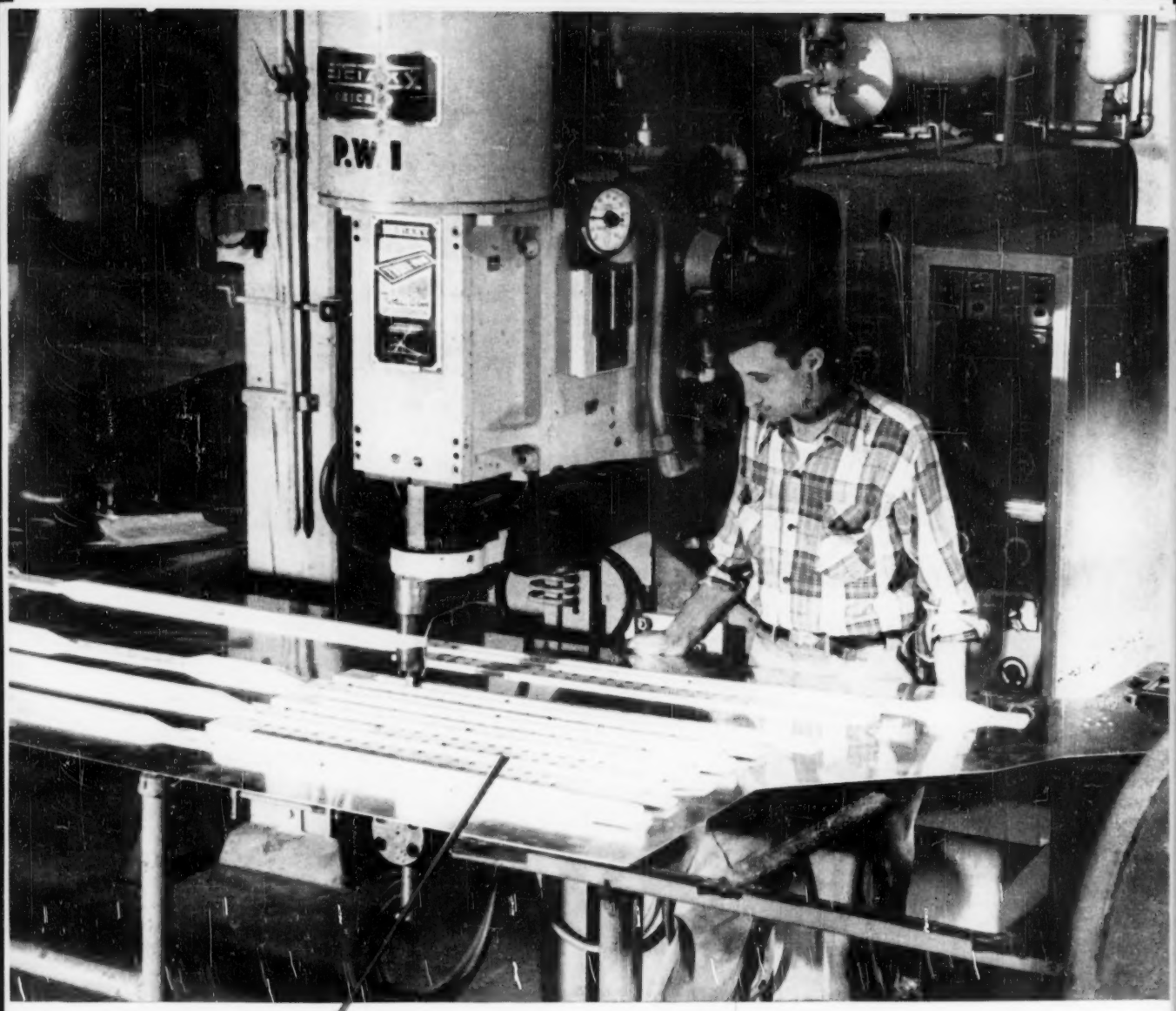

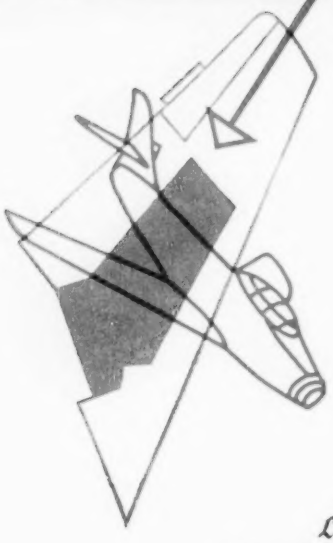

## Spotwelding .240 75st Aluminum Stringers to .081 75st Clad in Wing Section on F-84-F

These heavy section stringers are a Republic design improvement in wing structure of the battle proven F-84-F Thunderjet. This instance of improved design with resistance welding is not unusual — Republic design engineers are specifying five times more resistance welding in wing assemblies and three times more in fuselage assemblies than ever before.

The advantages of resistance welding in both airframe and jet engine fabrication are well known, Aircraft and Military specifications are most easily satisfied and maintained by Sciaky patented Three-Phase welders. That's why approximately 90% of all the resistance welding in airframe fabrication is done on Sciaky machines. Write for Bulletin 134ST for information on Sciaky Type ST aircraft welders.

The Sciaky Type ST welder shown above is one of many at Republic proving in daily production Sciaky's basic thinking of machine design to do *more useful work* at *lowest operating cost* with *maximum reliability.*

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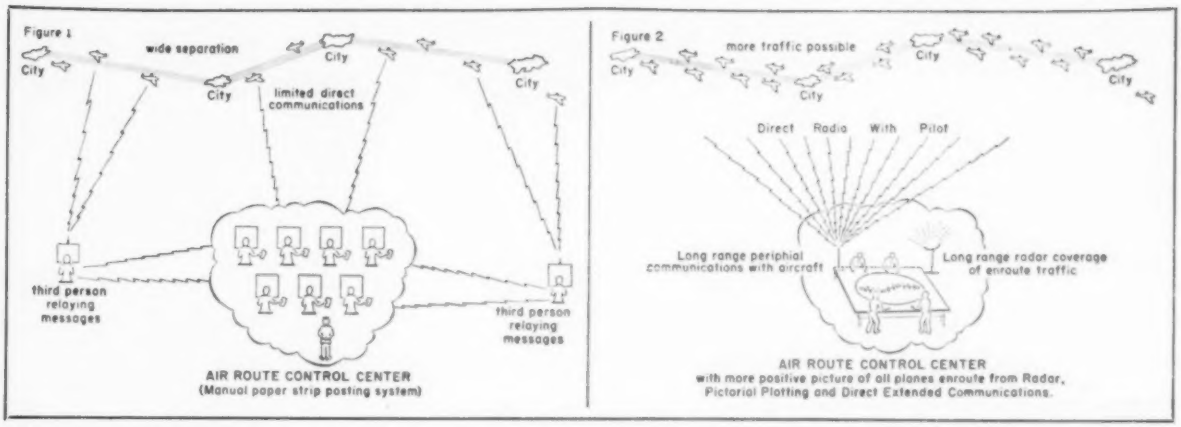
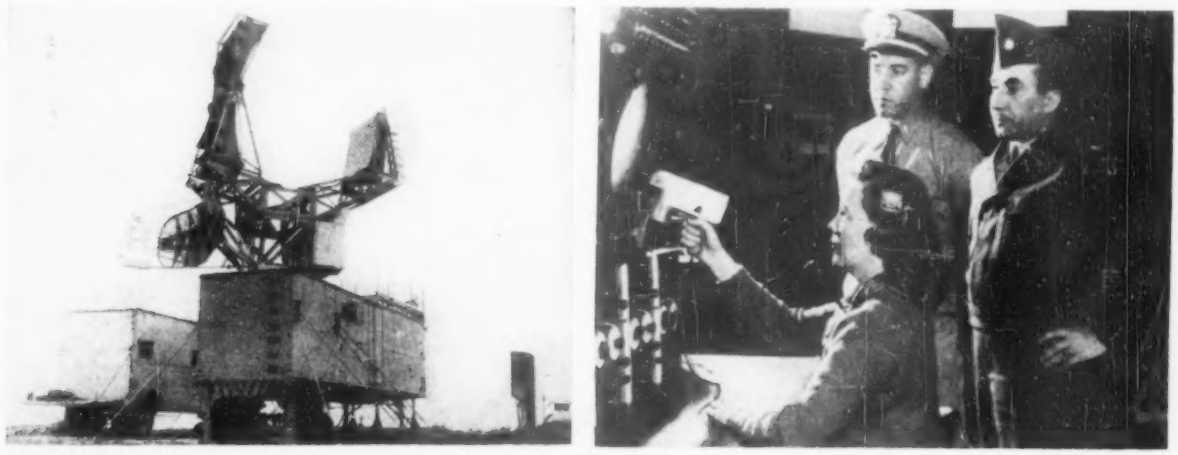



**IMPROVED TRAFFIC FLOW** is expected when present air route control centers (left) get new facilities (right), including longrange radar.



**PROJECT VOLSCAN,** AF's automatic air traffic control made up of radar (left) and computer plus display (right), calculates flight paths.

***Report on ACC Project:***

# Civil-Military Navaid Progressing

The longrange program to improve the Common System of civil-military air traffic control and navigation is showing significant progress, reports Robert Murray, Commerce Undersecretary for Transportation and Air Coordinating Committee chairman.

The study is being made by a special ACC group composed of government and industry representatives. Plans under consideration are:

- **Pictorial presentation** at air route control centers of planes enroute on the airways.
- **Combining air defense** and civil radar systems.
- **Increasing range** and speed of longrange aeronautical communications.

The ACC group also is evaluating the USAF-developed "Volscan," an electronic computer device that is coupled with radar and permits rapid handling of approaches and landings.

▶ **Radar Control**—Present system of plotting air traffic involves complicated communication and coordination between controllers. Various aircraft positions, altitudes and speeds are written on strips of paper and passed from one controller to the next—slowing the process.

The ACC group is working with the Civil Aeronautics Administration's Technical Development and Evaluation Center on a radar map-plotting display that enables controllers to see aircraft as they progress along the high-density airways.

Huge plotting tables and horizontal long-distance radar show airways systems exactly as they exist in airspace. This enables the controller to prevent collisions while directing increasing numbers of aircraft.

▶ **Direct Communication**—The ACC group is making every effort, Murray says, to integrate available civil and military radar with the special air defense network and other military radar to improve the volume and safety of air traffic control.

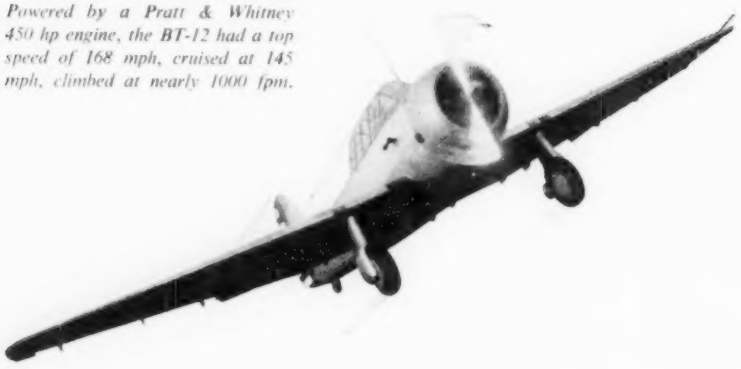
A successful integration "could save millions of dollars in future appropriations for our expanding airways system," he adds. "It may also provide the longrange radar component of the common system."

Provision for direct radio telephone communications between pilots and controllers is under way, ACC reports.

▶ **Volscan Difficulties**—As an example of increasing civil-military cooperation in development of a common system, Murray cites the request by Air Force Undersecretary James H. Douglas to have ACC evaluate "Volscan." The ACC group viewed Volscan in operation recently and approaches at 30-sec. intervals were demonstrated.

"The group's preliminary investigation revealed certain operating difficulties concerning the use of Volscan in the common system," Murray says. "Evaluation may reveal the possibility of eliminating these. . . ."

*Stainless Steel BT-12 Basic Trainer. Powered by a Pratt & Whitney 450 hp engine, the BT-12 had a top speed of 168 mph, cruised at 145 mph, climbed at nearly 1000 fpm.*

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FLEETWINGS DIVISION

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# Bell Chairman Sells 10,000 Stock Shares

Disposal of 10,000 shares of Bell Aircraft Corp. common stock by board chairman Lawrence D. Bell is reported by the Securities & Exchange Commission for the period of Oct. 11 to Nov. 10. Chairman Bell's common stock holdings now total 1,000 shares.

Other aviation industry transactions:

**Aero Supply Mfg. Co., Inc.** Disposal of 500 common shares by Henry A. Rudkin, director, his total holding.

**Air Associates, Inc.** Disposal of 800 common shares by C. Kenneth Baxter, director, his total holding.

**Alaska Airlines, Inc.** Disposal of 2,200 common shares by Paul C. Taylor, director, leaving a holding of 6,700.

**Allegheny Airlines.** Acquisition of 575 common shares by Henry A. Satterwhite, director, making a holding of 11,475.

**American Airlines, Inc.** Disposal of 1,300 common shares by William Littlewood, officer, leaving a total of 3,000.

**Beech Aircraft Corp.** Disposal of 400 common shares by Mrs. Olive Ann Beech, officer and director, leaving a holding of 63,822; disposal of 900 common shares in trust, leaving a total of 45,170.

**Bendix Aviation Corp.** Acquisition of 200 common shares by Arthur E. Raabe, officer, his total holding.

**Braniff Airways, Inc.** Disposal of 100 common shares by Charles E. Beard, officer and director, leaving a total holding of 2,000; acquisition of 23,300 common shares by William A. Blakley, director, making a total holding of 63,605.

**Capital Airlines, Inc.** Disposal of 200 common shares by J. D. Stetson Coleman, director, leaving a total holding of 5,000; acquisition of 250 common shares by Hayes Dever, officer and director, making a total holding of 475; acquisition of 500 common shares by David L. Frawley, director, making a total holding of 1,520; acquisition of 100 common shares by Arthur F. Kroeger, director, making a total holding of 700;

## Safety Record

All-time safety and traffic records for U. S. airlines in 1954 are predicted by Civil Aeronautics Board. CAB estimates for the year indicate a record low passenger fatality rate and a record high number of passengers carried and passenger-miles flown.

The safety forecast is based on records to date and an estimate to the end of the year. It shows a passenger fatality rate of 0.08 per 100 million passenger-miles for U. S. scheduled foreign, territorial and domestic air carriers—a record low.

Large U. S. irregular air carriers have operated without a single passenger or crew fatality up to the present time. According to Board estimates, the nonskeds will carry about 650,000 passengers approximately 1.3 billion passenger-miles in 1954.

CAB expects scheduled domestic, foreign and territorial airlines to carry 35 million passengers and fly 21 billion passenger-miles. These estimates are based on actual figures for nine months of operation.

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AIRCRAFT PRODUCTS DIVISION

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acquisition of 1,000 common shares by James R. Stockton, director, making a total holding of 2,550.

**Cessna Aircraft Co.** Disposal of 800 common shares by Dwane L. Wallace, officer and director, leaving total holding of 68,200.

**Curtiss-Wright Corp.** Acquisition of 600 common shares by S. B. Kurzina, Jr., officer, making a total holding of 600.

**Eastern Air Lines, Inc.** Acquisition of 100 common shares by Stuyvesant Peabody, Jr., director, making a total holding of 200; acquisition of 500 common shares by McGregor Smith, making a total holding of 500.

**Fairchild Engine & Airplane Corp.** Acquisition of 100 common shares by William Preston Lane, Jr., director, making a total holding of 600; acquisition of 200 common shares by F. Eugene Newbold, Jr., officer, making a total holding of 200.

**General Dynamics Corp.** Disposal of 425 common shares by Carleton Shugg, officer, leaving a total holding of 1,200.

**General Electric Co.** Disposal of 600 common shares by William C. Wichman, officer, leaving a total holding of 2,190.

**Lear, Inc.** Disposal of 1,000 common shares by William P. Lear, director, leaving a total holding of 408,925; acquisition of 1,000 common shares by Kenneth MacGrath, director, making a total holding of 1,200.

**Lockheed Aircraft Corp.** Disposal of 450 capital shares by D. E. Browne, officer, leaving a total holding of 2,568; disposal of 1,155 capital shares by L. W. Wulfekuhler, officer, leaving a total holding of 1,272.

**Glenn L. Martin Co.** Acquisition of 4,000 common shares through exercise of option by Jess W. Sweetser, officer, making a total holding of 7,000.

**McDonnell Aircraft Corp.** Acquisition of 24,654 common shares by J. S. McDonnell, officer and director, making a total holding of 116,611.

**National Airlines, Inc.** Acquisition of 100 common shares by Charles E. Banks, officer, making a total holding of 200; acquisition of 125 common shares by Alexander G. Hardy, officer, making a total holding of 200; acquisition of 250 common shares by John L. Morris, officer, making a total holding of 1,260; acquisition of 1,000 common shares by J. M. Rosenthal, officer, making a total holding of 2,500; acquisition of 100 common shares by Charles F. Sharp, officer, making a total holding of 381; acquisition of 600 common shares by R. E. Wieland, officer, making a total holding of 2,008.

**Northrop Aircraft, Inc.** Disposal of 630 common shares by George Gore, officer, his total holding.

**Northwest Airlines, Inc.** Acquisition of 300 common shares by Whitney Securities Co., making a total indirect holding of 1,000 and a direct holding for Wheelock Whitney, director, of 500.

**Pan American World Airways, Inc.** Acquisition of 400 common shares by Edward O. McDonnell, director, making a total holding of 500.

**Piper Aircraft Corp.** Acquisition of 200 common shares by Charles W. Pool, officer and director, making a total holding of 200.

**Seaboard & Western Airlines, Inc.** Disposal of 1,000 common shares by Warren H. Renninger, officer, leaving a total holding of 13,625; disposal of 500 common shares by John H. Rosenwald, officer, leaving a total holding of 51,175.

**Sperry Corp.** Acquisition of 3,000 common shares by Preston R. Bassett, officer, making a total holding of 3,636.

**Thompson Products, Inc.** Disposal of 300 common shares by Harry D. Bubb, officer, leaving a total holding of 158; acquisition of 500 common shares by Paul D. Hileman, officer, making a total holding of 2,674.

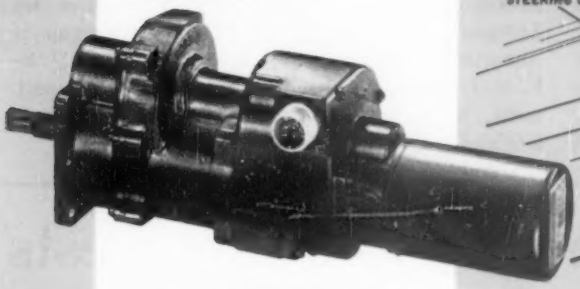
**Trans World Airlines, Inc.** Disposal of 1,000 common shares by R. S. Damon, officer and director, leaving a total holding of 2,790.

**United Air Lines, Inc.** Disposal of 500 common shares by Justin W. Dart, director, making a total direct holding of 10,000 and an beneficial holding of 1,500.

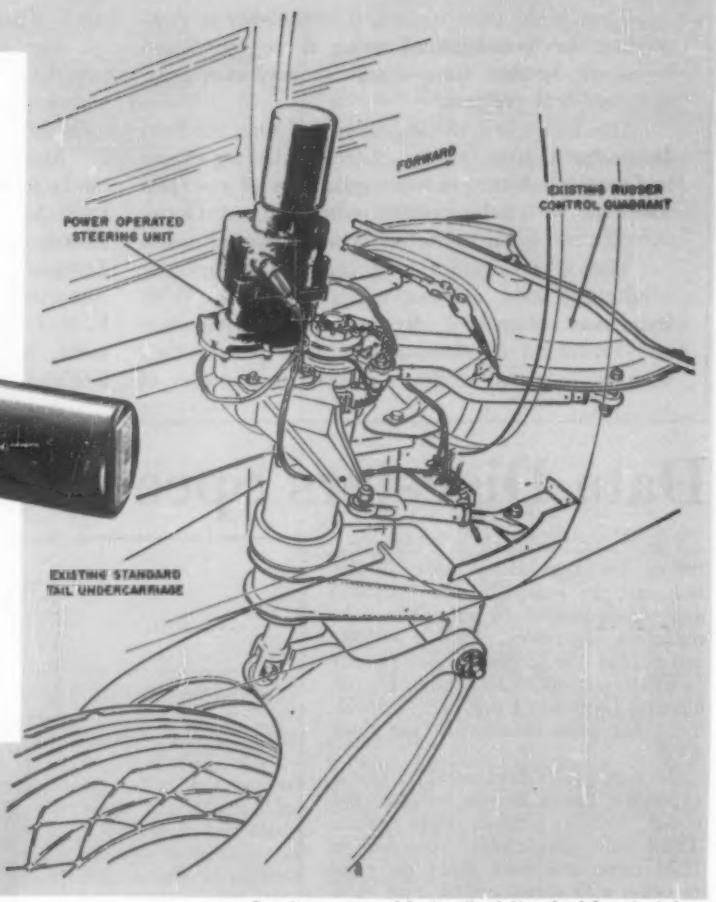
**United Aircraft Corp.** Disposal of 1,000 common shares by William R. Robbins, officer and dircetor, leaving a total holding of 2,800.

**Western Air Lines, Inc.** Disposal of 135 capital shares by Marvin W. Landes, officer and director, leaving a total holding of 365.

**R-652 actuates the tailwheel power steering installation in De Havilland of Canada's DHC-3 Otter**



The R-652 operates at 10 rpm at maximum operating torque of 1000 lb. in. Overload slip clutch adjusted to slip at 1200 lb. in. Magnetic clutch will hold maximum load with 17 volts min. applied. The R-652 weighs 8.15 lb.




*Drawing courtesy of De Havilland Aircraft of Canada, Ltd.*

# AIRBORNE'S FAVORITE OF THE BUSH LEAGUE

Airborne's R-652 rotary actuator supplies the finger-tip taxiing control bush pilots need to fly the Otter in and out of makeshift strips in Canada's rugged north. On landing and take-off, the pilot energizes the actuator, which locks the tailwheel in phase with the rudder. The R-652, mounted on the tailwheel spindle, has proved as sturdy and reliable in service as the Otter itself.

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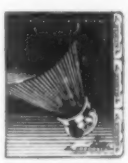


**COMPLETE INFORMATION**
on the Airborne line of electro-mechanical actuators is contained in our new aviation catalog. Send for your copy today.

Time is the most important commodity in engineering; the techniques of saving it are varied and ingenious, because time equals money, manhours, materials—and progress.

One area where the importance of time has been demonstrated is in testing. Adequate testing of any engineering subject produces quantities of raw data which must be read, processed, reduced to useful form, analyzed and tabulated before being of any real value.

Here is one significant approach to time-saving in windtunnel tests: automatic data reduction. With these new schemes of electronic reading, reduction and tabulation of thousands of data points, time between tests and results is reduced to a matter of minutes rather than weeks it formerly took.

The Convair system described here is from material furnished by R. J. Volluz, chief of their supersonic windtunnel, and M. G. Wade, assistant research group leader.

More information on other successful systems can be found in two AGARD Memoranda: "Methods Used by NACA for Data Reduction," by Ira H. Abbott of the National Advisory Committee for Aeronautics (AGARD AG3/M2) and "A Scheme of Automatic Data Reduction for Windtunnels," by K. V. Diprose, of the Mathematical Services Department, Royal Aircraft Establishment, Farnborough, England (AGARD AG9/M5).

# Data Digesters Speed Windtunnel Tests

One major roadblock in windtunnel testing—the time delay between the test and the availability of corrected data—is eliminated by automatic data reduction equipment. Such a system, installed at the Ordnance Aerophysics Laboratory, operated by Convair Div. of General Dynamics Corp., Daingerfield, Tex., has been in constant use since 1951.

An example of time saved: A recent supersonic ramjet diffuser test recorded about 35,000 pressure data points. These were immediately recorded on IBM cards and were ready for computation with almost no time lag. Under the old procedure of photographic processing, reading, punching and verifying, it would have taken nearly 115 manhours to process the data to the point where computation could proceed.

The system at OAL was first tried in 1950. It is based on the conversion of strain gage voltages to digital information which is utilized to supply information through an IBM card program calculator for computation.

► **Use of the Tunnel**—The major effort at the OAL windtunnel is development testing of supersonic guided missiles for the Navy Bureau of Ordnance Bumblebee project. The facility is owned by Naval Ordnance, and it is operated by Convair for them. Additional work in the tunnel is done for contractors to the United States Air Force and the Navy Bureau of Aeronautics.

Mach numbers between 1.25 and 2.50 are available for testing models

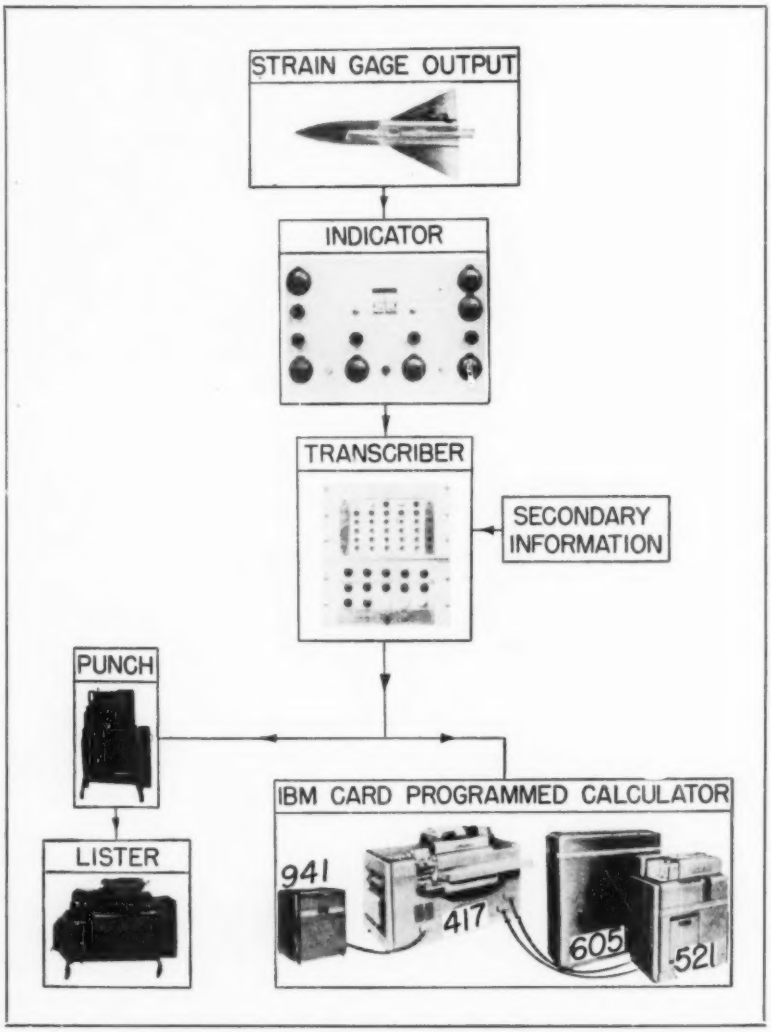
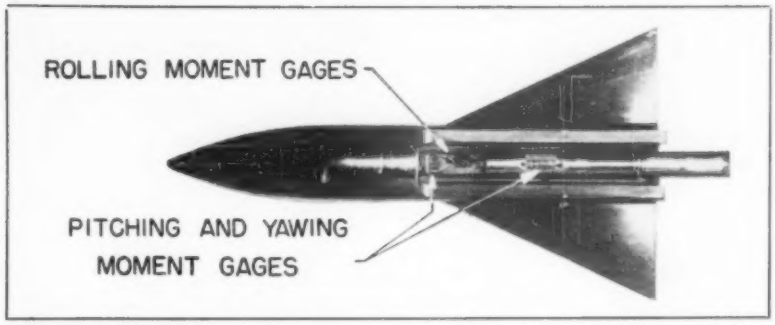
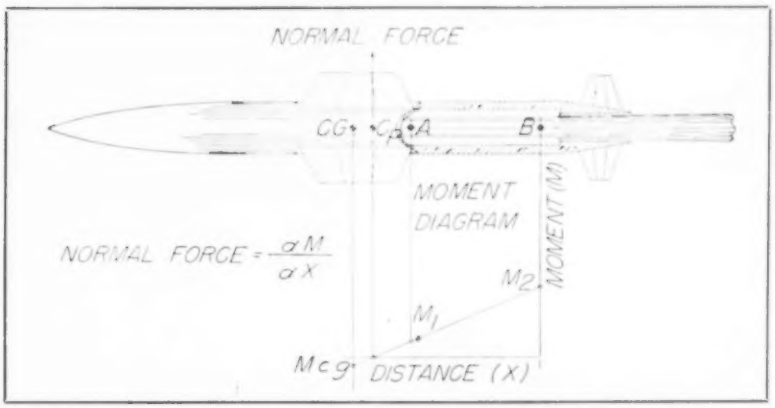



**CHART SHOWS FLOW** of information in Convair's system for the automatic reduction of windtunnel test data.




**CUTAWAY MODEL** shows typical five-component strain-gage internal balance installation.




**TYPICAL** continuous panel-bending-moment record for wing of cruciform structure.

of missiles and airplanes. Instrumentation, developed at OAL, records multi-component force data simultaneously, and automatically reduces the data to aerodynamic parameters.

Convair measures aerodynamic forces on the model with four strain gages, each composing a full bridge circuit. These gages indicate the strain due to bending moment in the cantilever beam represented by the model. Knowing the moment at two points on the beam, the normal force can be found from the slope of the moment curve. Accuracy is increased by placing the forward set of gages as close as possible to the reference point about which moments are summed; for most models, this is the center of gravity.

The figure above shows a typical strain-gage internal balance installation, cut away to show the relative position of the gages. The strain gages are separated by a short length of cruciform cross section where suitably mounted strain gages can be used to measure the rolling moment inside the model. The practice at OAL is to measure drag with an external, remote-roll-indexing balance which supports the internal balance. These balances are also instrumented to measure rolling moment when it is inconvenient to utilize the cruciform section. Output voltages from the strain gage bridges are fed into the main control panel.

► **Information Flow**—The block diagram on page 26 shows the flow of information from the model until it comes out as aerodynamic data. Six identical indicators are used, each with four channels; thus it is possible to measure six components simultaneously in each of four groups for a total of 24 components.

The indicator reads the voltage output from the bridge, and produces a voltage of equal magnitude and opposite sign. This voltage is balanced by means of a servo-driven step-switch, slide-wire combination. The resulting mechanical motion operates dials for a visual numerical indication of the signal and also sets up electrical circuits in the transcriber section. Secondary information is fed into the transcriber by the use of an IBM manual keyboard; the input includes model roll attitude, windtunnel stagnation pressure and the run number. Model angle of attack is automatically fed in.

The digitalized information passes through the transcriber to the punch where the raw data are recorded on standard IBM cards. After the cards have been punched, the same data are listed.

Just before punching, the raw data are routed to the card-programmed calculator section where it is reduced to aerodynamic data in coefficient form. In the programming unit, the computer calculates the difference between the strain gage reading obtained under load and the reading under zero load. These data are now stored until called for in subsequent computations. All computing is done by the 605 unit except for minor additions or subtractions.

Final answers arrive in the 417 unit, and are then passed to the punch for recording on cards and also tabulated on the 417 unit.

Computed coefficients are generally obtained within 20 to 25 seconds after the system is energized. They may be presented in one or two systems of axes together with angles of attack and sideslip corrected for deflection of the model support under load. A wide variety of aerodynamic parameters may be computed on the spot, and are available immediately to aid or to verify decisions of the test program.

► **Accuracy**—A digital computer theoretically introduces no inherent mathematical errors, and therefore the resulting values are as accurate as the information supplied. Thus the accuracy of the whole system depends on the accuracy with which the strain-gage voltage output can be read.

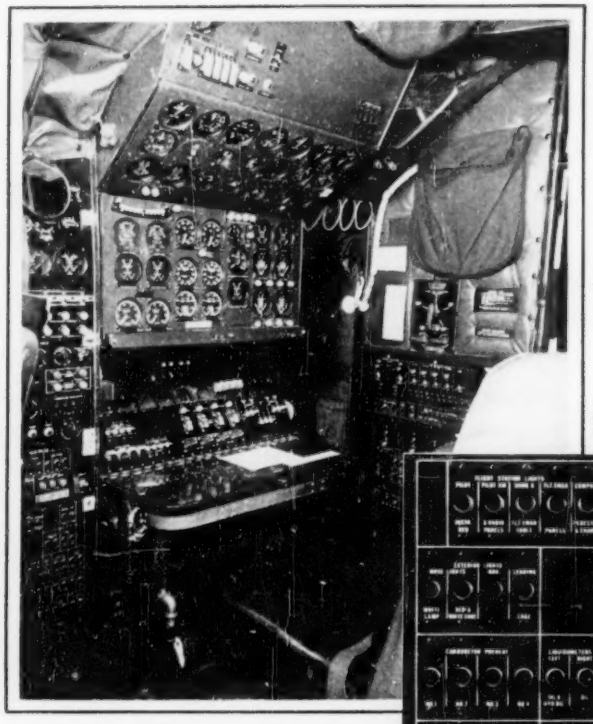
For most tests at OAL, normal force can be measured to ± 0.2 lb., and pitching moment can be determined to ± 0.6 in. lb. These figures correspond to approximately ± .3% and ± 0.5% of the maximum loads generally encountered.

► **Other Systems**—OAL has used both digital and analog data-reduction devices, and they feel that from their experience, the analog system is best for the continuous tracing of non-linear windtunnel data.

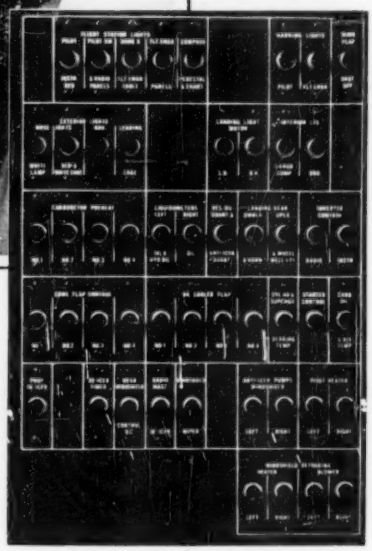
The aerodynamicist may want an instantaneous and continuous trace of wing bending moment as a function of the roll attitude of a model at a constant angle of attack. Convair says that the simplest form of analog computer, combined with a modified plotter, will continuously record that kind of information as the model is rolled. A typical example of a continuous panel-bending-moment record is shown above, left, for the right wing of a cruciform wing-body combination with the wing horizontal when roll angle equals 0 deg.

Engineers believe that further development of continuous computing-recording equipment will provide valuable tools for exploratory windtunnel tests, and the means to define regions of non-linear aerodynamic characteristics.

► **Pressure Testing**—Highspeed data reduction of pressures measured at various points on a windtunnel model have long been a problem of major proportion. Normally, pressures are photographed directly by a camera aimed at a specially designed and lighted manometer board. This saves actual wind-



A typical Klixon Circuit Breaker Panel in the Super Constellation.



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Rugged and dependable, Klixon Breakers withstand high shock and vibration under all flying conditions. They are precision calibrated and individually tested for ultimate trip and 200% load-tripping characteristics. Write for data giving complete details.

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D6752-1 Push-Pull Ratings: 5 to 50 amps.

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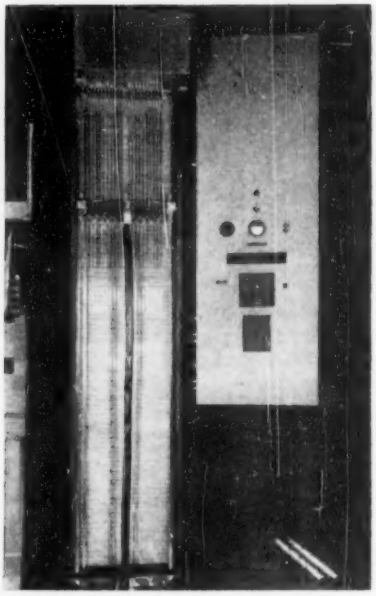


**ADRMAN** uses photocell for automatic, speedy recording of manometer readings.

tunnel time, because data can be taken as fast as the manometer stabilizes.

But it still takes an excessive number of manhours to read the photographs, transcribe the pressures in the cards, verify the readings and then reduce the data. Operator fatigue, caused by long hours of reading photographs, enters into these computational techniques.

▶ **Recordin ; Manometer**—Engineers at OAL have developed the Adrman (automatic digital recording manometer). Using a photoelectric cell, Adrman automatically records pressures in digital form so that the IBM equipment can be used to reduce pressure data immediately to the required aerodynamic parameters. Each tube on the manometer board is scanned by a photoelectric cell and the pressure reading from a counting mechanism is stored when the light beam of the cell passes the meniscus of the tube. A counter reads the nearest tenth of an inch.

The automatic board at OAL is a 20-tube evaluation model, but is frequently used during regular testing operations.

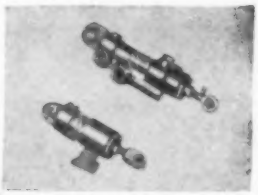
Pressures are immediately punched in IBM cards and tabulated in the same manner as the strain gage data from force tests. The pressure data are also handled by the computer in the same manner.

▶ **Diffuser Testing**—Convair says the most notable use of this automatic recording manometer is in testing supersonic diffusers for ramjets, where the data include the average total pressure recovery, air flow, and internal and external drag characteristics.

A large number of pressures are involved in data reduction, and computa-

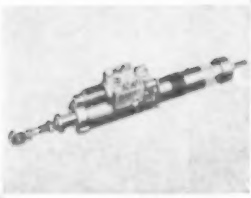
# LOUD...

*primary source of actuating cylinders on the West Coast*

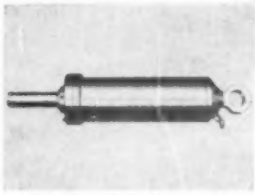


*Gun Purge Door Cylinder – 3000 psi, 3/4" bore x 2-1/2" stroke*

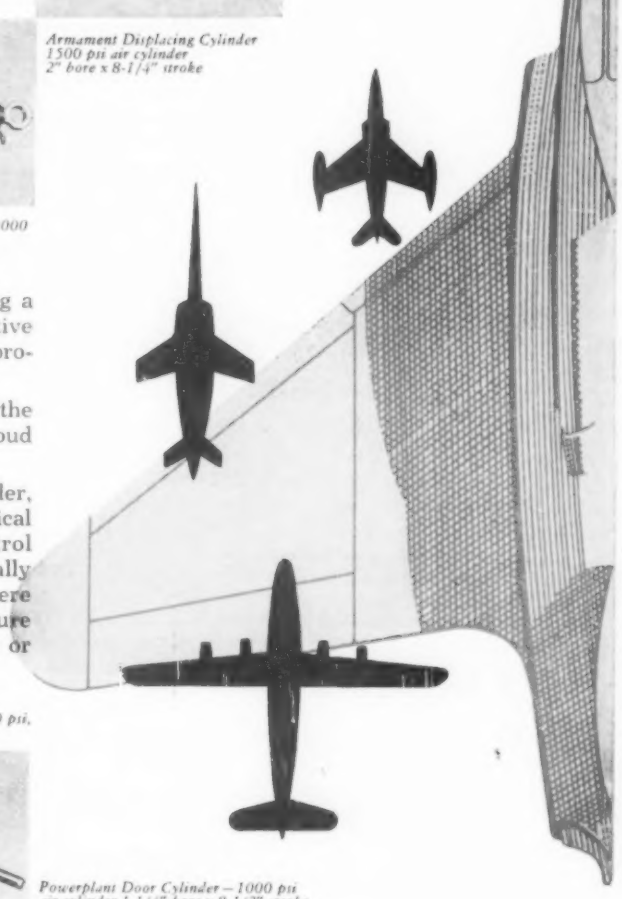
*Door Latch Cylinder – 3000 psi, 1-1/16" bore x 1" stroke*



*Armament Displacing Cylinder 1500 psi air cylinder 2" bore x 8-1/4" stroke*



*M.L.G. Actuating Cylinder – 3000 psi, 6" bore x 17-1/2" stroke*

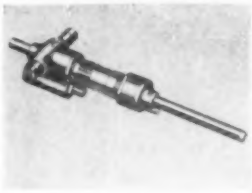


When a manufacturer gains the reputation of being a primary source for any product, it is usually indicative that they have the "know how" and facilities to produce at competitive prices.

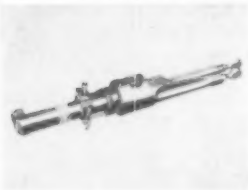
The ability to produce the smallest to the largest, the simplest to the most complex cylinders has made Loud top source for high quality – low priced units.

In addition to making the ordinary actuating cylinder, Loud produces units containing integral mechanical locking devices, snubbing cylinders, power control booster cylinders, as well as a patented mechanically locking cylinder adaptable to many applications where the load is required to be firmly held without pressure and yet easily unlatched and moved hydraulically or pneumatically.

*Aileron Booster Cylinder – 1500 psi, 1-9/16" bore x 6-1/8" stroke*

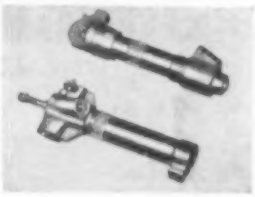


*Powerplant Door Cylinder – 1000 psi air cylinder 1-1/4" bore x 8-1/2" stroke w/mech. locks at both ends of stroke*



*Nose Gear Door Cylinder – 3000 psi, 1-3/16" bore x 7" stroke*

*Nose Wheel Steering Cylinder – 3000 psi, 1-1/4" bore x 6-3/4" stroke*



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tions are so complex that diffuser tests are generally run by taking data at predetermined points over a wide range. This frequently results in increased testing time and taking redundant data in order to bracket the critical ranges of the various parameters.

The use of the automatic recording manometer means that the necessary computations for each point can be completed in about 30 sec, and the test engineer can quickly locate a proper range to investigate.

This pilot model automatic manometer was built originally to evaluate the problems associated with such equipment and to evaluate the accuracy obtainable.

Calibration tests conducted recently showed that 99.2% of the pressures recorded were within ± 0.1 in. mercury of the correct pressure, which is the design accuracy of the counting equipment.

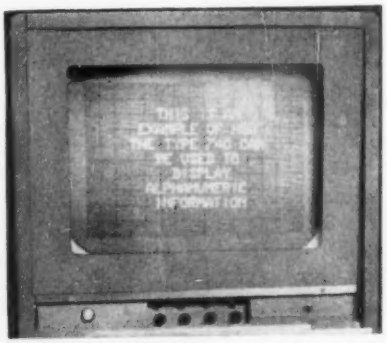
A final working model developed at OAL will have 60 tubes reading to the nearest half tenth of an inch and this will service 85% of the pressure testing requirements at the Daingerfield establishment.

## Computer Results Shown in 'Window'

A new device can visually display the results of digital computer calculations on cathode ray tubes, eliminating the previous bottleneck of printing out such results.

Developed by International Business Machines Corp., the device can picture computer results in the form of graphs, geometric figures, engineering symbols, or words and numbers. It is called the Type 740 CRT Output Recorder, and is designed for use with IBM's Type 701 and 704 computers.

If the computer is working out an airplane's flight path, this answer can be displayed graphically on the 740's 21-in. CRT. If the problem is to determine the shape of a cam, this too can be displayed visually. The same



**WORDS OR PICTURES** on recorder's cathode ray tube show computer output.

*Boeing employees watch roll-out of 1000th B-47, covered with their contributions to a charitable organization.*

## The 1000th B-47 comes off the line

In March, 1950, the first production B-47 rolled out of the Boeing plant in Wichita, Kansas. On October 14 of this year, the 1000th Boeing-built B-47 came off those same assembly lines.

The Boeing B-47, also being produced by Douglas and Lockheed, is the Strategic Air Command's front-line, high-altitude medium bomber, and is capable of carrying a nuclear weapon 10 miles a minute. Already SAC's Second Air Force has been completely equipped with B-47s, making it America's first all-jet striking force. Additional SAC units are in the process of making the same transition to jets.

Boeing's Wichita Division has, from the first, carried out continuing programs to lower production costs and to maintain on-schedule deliveries. The advanced B-47 is now being produced with fewer man-hours per pound than were required for the much less complex B-29 during World War II. As a consequence, the cost of the B-47 has been reduced well below the best original estimates, and resultant savings have been passed on to the government.

Today, besides building B-47s, the Boeing Wichita Division is tooling up as a second manufacturing source of the B-52 eight-jet heavy bomber, which is now in production at the Boeing Seattle plant.

This crest is symbolic of the Strategic Air Command's strength and global achievements. It is found on such Boeing planes as the B-29, B-50, KC-97, B-47—and now on the B-52.

BOEING

information is also displayed on a small 7-in. CRT which can be photographed by a 35-mm. camera.

The new recorder can display computed data points at the rate of 8,000/second, providing output speeds compatible with the computation speeds of the 701 and 704.

Accuracy of the visual display is within 3% on the larger tube, and is within 0.1% on the small scope, according to IBM.

By using suitable programming techniques, the CRT displays and the operation of the camera can be controlled automatically from the computer itself, IBM says.

## Franklin Tests New Supercharged Engine

Tests are being made in a tied-down Sikorsky H-18 (S-52) helicopter of a new Franklin supercharged engine said to deliver 300 bhp. from sea level to 3,000 ft. altitude.

Engine and turbosupercharger have successfully completed official military qualification tests, Aircooled Motors, Inc., Syracuse, N. Y., reports. The powerplant is also adaptable to horizontal installation with minor oil system changes.

The new engine, designated O425-13, is a development of another Franklin engine revealed recently, the O425-2 (AVIATION WEEK Aug. 23, p. 24).

The turbosupercharger, designed and developed by Aircooled Motors, will supply 40-in. of mercury absolute pressure at the carburetor inlet up to 16,000 ft., although the engine at present rating only utilizes this boost to 10,000 ft. This turbo in its present form can be adapted to engines up to about 400 hp., and with modification, can be fitted to 200-hp.-class engines.

It features a radial discharge, backward sloping impeller and a single-stage axial-flow turbine wheel having cast Stellite blades. Blades are shrouded, twisted and hollow. They are welded to the chrome-nickel-moly stainless steel turbine hub by an automatic shielded-arc process. The turbo operates at 38,600 rpm. with maximum allowable gas inlet temperature of 1,625F.

A regulator, developed by Eclipse-Pioneer Division of Bendix Aviation Corp., is designed to limit the supercharger's maximum speed and to maintain, at any altitude the manifold pressure selected by the pilot. It operates hydraulically on engine oil pressure and actuates throttle and exhaust gas waste gate.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To obtain copies of the reprints, write to FSF. Single copy prices are given. Prices for quantity orders are available on request. Address: Flight Safety Foundation, Inc., 471 Park Ave., New York 22, N. Y.

- **Protective Design in Forward and Rearward Facing Seats in Transport Aircraft.** Discussion of the controversial topic. Hugh De Haven, Crash Injury Research. SAE paper. 6 pp. Jan. 1953. Price 25¢.
- **Technical Trends in Air Transport.** Excerpts from IAS Wright Brothers lecture, Dec. 1952. William Littlewood, Amer. Airlines. 13 pp. Price 50¢.
- **Survival of Research Projects in the Field of Aviation Safety.** Second annual supplement. Listings of 1,100 projects in various fields, including section on completed projects, Cornell-Guggenheim Aviation Safety Center. 109 pp. Jan. 1953. Price $1.00 (See #35).
- **Research and Development to Promote Safety in Aviation.** Review of aircraft design and operation, and suggestions for additional research. Dr. T. P. Wright. SAE Reprint. 28 pp. Sept. 1950. Price 25¢.
- **Aviation Progress and Safety Should March Hand in Hand.** Pressures and attitudes of management on safety matters. J. Lederer, SAE paper. 6 pp. March 1951. Price 25¢.
- **Safety Survey of Pacific Coast Aviation**

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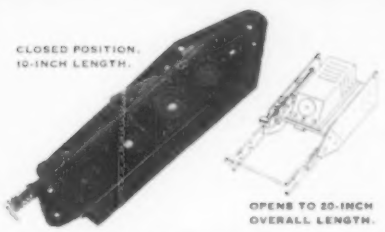


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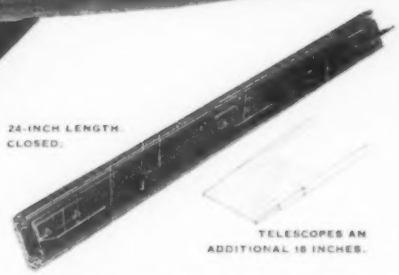


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Designed for mounting of table or equipment frame to slide forward and back. Three-stage, precision, economical sheet metal construction in counterpart pairs, equipped with slides and stops to govern the length of travel; operating on ball-bearing races held to 3/1000's for reduction of compartment noise. Slides are 24 inches long, telescoping an additional 18 inches; accommodating 150 to 250 lbs. extended. Slides shorter in length, of same width and depth, or 2-stage, can be manufactured by UNIVERSAL from existing tooling.

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Of precision sheet metal construction, Universal's stamped slides are designed to replace extruded types—with important economies in weight and space, as well as development time between concept and final assembly.

The successful development of this complex stamping assembly is another example of priceless UNIVERSAL "know-how" for turning out quality, in volume—to "specs" and on schedule.

Now, with a complete new plant, and enlarged staff of skilled engineering personnel... UNIVERSAL is more than ever equipped to take on difficult jobs, and handle them to your complete satisfaction. *Write for facilities brochure*

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**Industry.** Review of activities in colleges, industries, and airlines connected with aviation safety. W. L. Lewis, Western Rep. Guggenheim Avia. Safety Center. 22 pp. April 1951. Price 25¢.

• **Comparative Significance of Transport Safety Statistics.** Presentation of new statistical measure, "life-years lost" as basis for accident rates. Rudolph Modley. IAS Annual Meeting paper. 7 pp. Jan. 1951. Price 25¢.

• **Recent Developments in the Field of Landing Speed Reduction and Hovering Aircraft.** Methods of achieving slow-speed controlled flight and vertical landings. David H. Kaplan. 8 pp. May 1951. Price 25¢.

• **The Challenge of Air Safety to Human Engineering.** Where the doctor and psychologist can assist the designer and operator to achieve greater safety. Lynn S. Beals, Jr., Special Devices Center. 6 pp. May 1951. Price 25¢.

• **Safety Considerations in Aeronautical Engineering Education:** Develop ethical attitudes, emphasize human factors in engineering education. J. Lederer, Amer. Soc. for Engg. Education lecture. 15 pp. June 1951. Price 25¢.

• **Infusion of Safety into Aeronautical Engineering Curricula.** Adding safety concepts to courses without increasing load. Five principles of designing for safety. J. Lederer. Third International Conference, IAS-RAeS. 20 pp. Sept. 1951. Price 25¢.

• **Accident Survival—Airplane and Passenger Car.** Principles of packaging the passenger. Hugh De Haven, Crash Injury Research. SAE paper. 7 pp. Jan. 1952. Price 25¢.

• **Human Variables in Design and Operation.** Application of human engineering principles to cab design in trucks and buses. R. A. McFarland, Harvard School of Public Health. SAE paper. 14 pp. January 1952. Price 50¢.

• **Safety in Design.** Examples of accidents caused by design faults. Sidney Berman, USAF, Directorate of Flight Safety Research. IAS Annual Meeting paper. 26 pp. Jan. 1952. Price 50¢.

• **Functional Cockpit Design.** Recent physiological data for improved cockpit design. Barry G. King, Civil Aeronautics Adm., IAS Annual Meeting paper. 31 pp. Jan. 1952. Price 50¢.

• **The Airline Pilots Look at Safety.** Aircraft design and operation from a new viewpoint, including charts on accident rates by aircraft model and miles flown. W. W. Moss, Airline Pilots Assn. IAS Annual Meeting paper. 33 pp. Jan. 1952. Price 50¢.

• **Notes on Airport Safety.** Factors in airport design and operation to improve safety. J. Lederer, Airport Operators Council. 44 pp. March 1953. Price 60¢.

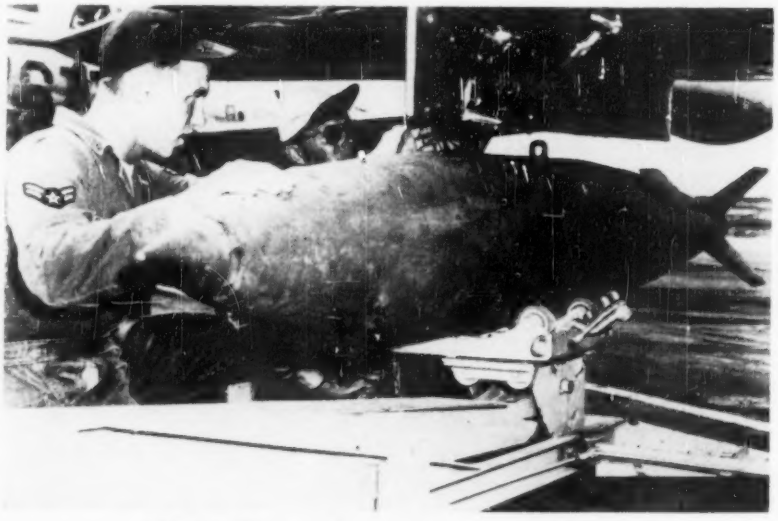
• **Design for Maintenance.** A British estimate of maintenance complexity. R. E. Bishop, Chief Designer, de Havilland Aircraft Co. 3 pp. March 1952. Price 25¢.

• **Design of Passenger Seats for Aircraft.** Discussion of factors in seat design, including strength, attachments, belts and rearward facing seats. Hugh De Haven, Crash Injury Research. 12 pp. June 1952. Price 25¢.

• **Cockpit Design and Safety.** Instruments and controls can be improved to reduce tension for pilot and crew. W. I. Stieglitz, Republic Aviation Corp. IAS Summer Meeting paper. 30 pp. July 1952. Price 50¢.

• **Crash Injury Study of the NEA-Convair Accident.** Basic accident injury findings and relationship to seats, belts, and structure. Crash Injury Research. 36 pp. Aug. 1952. Price 50¢.

• **The Human Factor in Aircraft Accidents.** Physical and psychological factors contributing to causes of accidents. J. A. Newton, ICAO. Reprint from ICAO Monthly Bulletin. 4 pp. September 1952. Price 25¢.



## USAF Tests Bomb Ejection Pylon

Pastushin Aviation Corp.'s forcible ejection pylon for fuel tanks (Aviation Week, Nov. 15, p. 68) has been found equally useful for ejecting bombs from their racks and insuring that they do not contact the airframe. Tests of the device with various types of bombs have been made at USAF Armament Center, Eglin AFB, Fla. Here an inert 1,000-lb. low-drag bomb is fitted to a Pastushin pylon beneath an F-86 Sabre's wing. Ejector charge separates the load at transonic or supersonic speeds regardless of plane attitude.

# Facts about *HELI-COIL* inserts in the aircraft industry

*What they are*

*Heli-Coil** screw thread inserts are precision-formed coils of stainless steel or phosphor bronze wire. Wound into tapped holes, they form permanent non-corrosive, strip-proof threads of astonishing strength.

*How they cut weight*

Threads tapped in aluminum or magnesium when protected by *Heli-Coil* inserts are much stronger, therefore you can use smaller, fewer, shorter cap screws for required strength. Fewer or shorter cap screws mean savings in fastening-weight, through lighter bosses, thinner flanges, and thinner wall sections.

*What they are for*

AS ORIGINAL COMPONENTS: *Heli-Coil* inserts are used to provide stronger, lighter fastenings, corrosion-proof, wear-proof, threads in all assemblies. Thus you find *Heli-Coil* inserts throughout aircraft engines, airframes, and accessories, from the heart of jet engines to skin inspection panels.

FOR PRODUCTION SALVAGE: When conventional tapped holes are damaged in production restore them on the line with *Heli-Coil* inserts. Get better-than-original strength with no increase in screw size and no telltale signs of rework.

FOR SPEEDY REPAIRS: When tapped threads are fouled up by wear, stripping, or corrosion in service, renew them in minutes on location in shop or field with *Heli-Coil* inserts.

No welding—no plugging—no secondary machining—no oversize screws.

For useful tips, use the coupon for free subscription to "*Heli*-Call" in which we publish latest news on what others are doing in your field.

*How they work*

Holes are drilled and tapped as you do for ordinary threads—*then Heli-Coil* inserts are wound into tapped holes by hand or power tools. Install in a few seconds, assure thread protection forever. Can be used in any metal, wood or plastic.

*No other method is so simple, effective and practical.*

*Heli-Coil* inserts improve the end product, cut rejects, salvage threading errors.

*All sizes and types*

Available for National Coarse, National Fine and Unified threads, pipe threads and spark plug threads. They are made in all standard sizes and lengths for assemblies requiring Class 3, 3B, 2 or 2B fits.

Best time to put *Heli-Coil* inserts benefits to your use is right at the designing board, as many leading manufacturers are doing. But to convince you of their many advantages ask for a working demonstration right on your production line. Write today! Complete information and engineering data is available in the *Heli-Coil* catalog. Use coupon!

*Reg. U. S. Pat. Off.

***Approved for All Military and Industrial Uses***

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**DESIGN** is the important factor in the aviation industry today — Designing with lighter materials, freer lines — but for more stress because of higher speeds and heavier loads.

**That's where *Heli-Coil* Screw Thread Inserts come in.**

***Heli-Coil*** Inserts permit the use of lighter materials in airframes, engines, instruments and component parts because ***Heli-Coil*** Inserts eliminate stripping, galling, corrosion, wear or cross-threading.

***Heli-Coil*** Inserts allow greater freedom of design because they are strong, permitting the use of fewer and smaller fastenings. And, because they eliminate the need for solid bushings, you can use smaller bosses and flanges.

Everywhere in the industry you will find ***Heli-Coil*** Screw Thread Inserts *designed into* airframes, engines and component parts. We'll be glad to send you full information on how you can benefit by using ***Heli-Coil*** Inserts in *your* product.

*Reg. U. S. Pat. Off.

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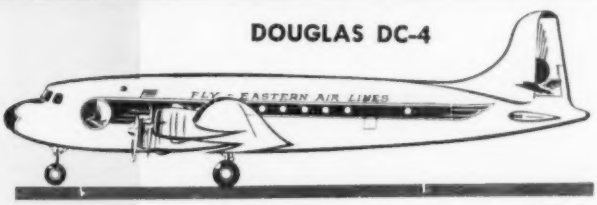


MARTIN SILVER FALCON

Eastern Air Lines (in common with most of the world's airlines) derives multiple advantages from the use of Vickers Hydraulics. First, it has the best aircraft hydraulic equipment available. Second, it obtains the many benefits of standardization. Third, it has the undivided responsibility of a single source.

Vickers Hydraulic Equipment has proved by hundreds of thousands of hours in the air its claims of longer life, greater dependability, better performance and lower maintenance.

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

## THRUST & DRAG

**Carols for an Age of Peril**

*"God rest ye merry, gentlemen, let nothing you dismay.*
*Remember that the H-bomb is deliv'rable today.*
*There's just one major problem: Who is carrying it which way?*
*Oh, tidings of comfort and joy, etc., etc."*

* * *

**"Oh, little town of Bethlehem, how still we see thee lie!**
**Above thy troubled, restless sleep the noisy fleets drone by.**
**The star that led the shepherds is a navigator's guide;**
**The wise men are in hiding, but there is no place to hide."**

* * *

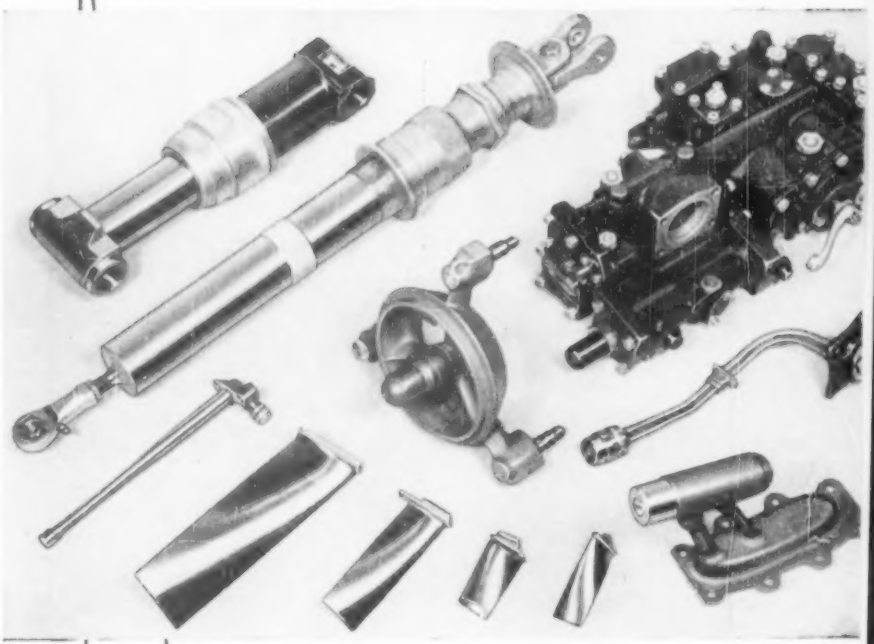
*"Hark the herald angels sing*
*Bigger bombers are the thing.*
*Peace on earth they guarantee*
*By H-capability.*
*Joyful, all ye nations rise;*
*Give us bases for our prize.*
*So that we may better be*
*Poised to strike back massively.*
*Hark, the Air Force angels sing,*
*Bigger bombers are the thing."*—DDA

### Flaming 'Saucer'

Flame research underway at Westinghouse Research Laboratories is expected to result in higher-efficiency jet engine combustion chambers. Using a specially designed vacuum rig in which simulated pressure can be varied from sea level to 60,000 ft., Westinghouse engineers can develop a flat stationary flame suspended above the burner. Using a movable thermocouple, or spectroscope as shown here, they can explore the flame and record its characteristics and burning efficiency. In this manner they can learn how to maintain fire in a small space to liberate the most possible energy.


Jet Parts and Assemblies

TO YOUR SPECIFICATIONS



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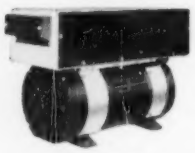

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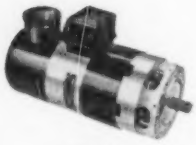
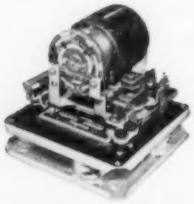


AC—DC GENERATORS

FRACTIONAL H. P. DC MOTORS

SPECIAL-PURPOSE ELECTRON TUBES



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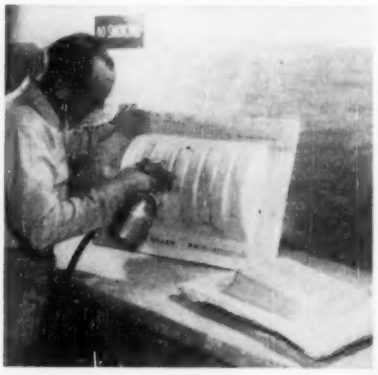
## PRODUCTION BRIEFING

▶ **Schedule delays on Northrop** Aircraft, Inc.'s production lines are now instantaneously reported to a central control area by means of TelAutograph system, the automatic method of transmitting handwritten communications commonly used in banks, hotels and other businesses. Leased transceivers are installed at 37 stations, with the system capable of handling up to 60. The Hawthorne, Calif., planemaker expects hookup to save up to $175,000 annually.

▶ **Radioplane Co.,** Van Nuys, Calif., has erected a 28,000-sq. ft. building to house its expanding Weapons Systems Division. Approximately 300 engineering personnel will be assigned to the corporate-financed building to work on highspeed, high-altitude pilotless aircraft and guided missile projects. The firm has built more than 40,000 pilotless aircraft as part of its target drone programs.



**SAVINGS** of five man-hours a day are being made at Temco Aircraft Corp. by spraying a strippable vinyl-base coat onto fresh plaster "splashes" used in making plastic dies. The coating prevents moisture, trapped in the plaster, from seeping into freshly poured plastic. Coating is Delco Chemical X-2000, normally used to protect sheet aluminum during handling, forming and riveting.

▶ **Aerovox Corp.,** New Bedford, Mass., has acquired Henry L. Crowley & Co., Inc., West Orange, N. J., makers of powder irons and steatite products used in electrical and electronic applications.

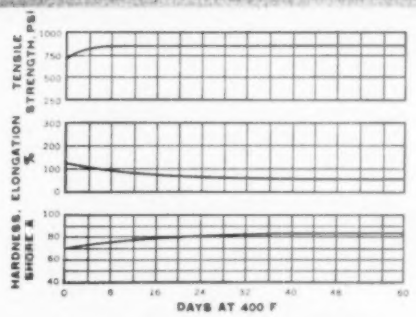
▶ **Bendix Foundries** is new name for former Eclipse-Pioneer Foundries Division, Teterboro, N. J.

▶ **Chicago Aerial Industries, Inc.,** is new name of former Chicago Aerial Survey Co., Chicago, Ill., in accordance with its expansion of research and production in aerial photography and other scientific equipment.

## CLASS 300 (LOW COMPRESSION SET)

**Absolute minimum compression set** at ordinary and elevated temperatures. Ideal for O-rings, seals, gaskets. *More "come-back"* than any known rubber!

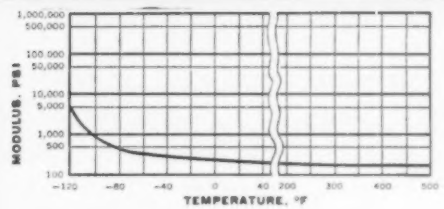
## CLASS 400 (GENERAL PURPOSE)




Typical effects of oven aging on physical properties of a Class 400 general purpose stock.

**Most economical class,** providing typical silicone rubber properties for gaskets, seals, O-rings, sleeves, boots, bellows, tubing, belting, shock mounts.

## CLASS 500 (EXTREME LOW TEMPERATURE)




Effect of temperature on flexibility of a typical Class 500 Extreme Low Temperature stock. (Young's Modulus in Flexure)

**Flexibility and recovery from compression down to −120 F!** Ideal for high-altitude flight applications where low-temperature flexibility is vital.

***G-E silicones fit in your future***

**GENERAL ELECTRIC**

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# G-E SILICONE RUBBER IS BEST FOR YOU?

General Electric silicone rubber is classified *according to dominant property* to make it easy for you to select and specify the *right* silicone rubber for the parts you need. You can be sure of *more exact performance* when you choose among the many classes of G-E silicone rubber.

**Send today** *for free "Lightning Selector"!* This handy chart makes it quick and easy for you to select and specify the best G-E silicone rubber for your job.

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Please send me product data on G-E silicone rubber, including a free "Lightning Selector" and up-to-date list of fabricators. I am chiefly interested in:

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| 5 ( ) Rubber-covered rolls | 13 ( ) Die-cut gaskets |
| 6 ( ) Belting | 20 ( ) Wire and cable insulation |
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# Smooth "High Road" to

SMOOTHEST and most efficient offshore crew transportation today is the modern helicopter, an aircraft proved in this tough assignment and backed by many millions of hours of operation throughout the world.

Around the clock, dependable Sikorsky helicopters now provide new speed, safety, seasick-free comfort and high availability in the transportation of operating personnel between the mainland and offshore stations.

The pictures on these pages tell the story. They illustrate the smooth "high road" to offshore drilling barges in the Gulf off Texas and Louisiana.

**1.** **OIL CREWMEN** and their baggage are weighed in before boarding an S-55 for a 30-minute flight from the mainland to a barge 45 miles out in the Gulf.

**2.** **S-55 HELICOPTER,** loaded with offshore crewmen, takes off from the heliport on a Grand Isle office parking lot.

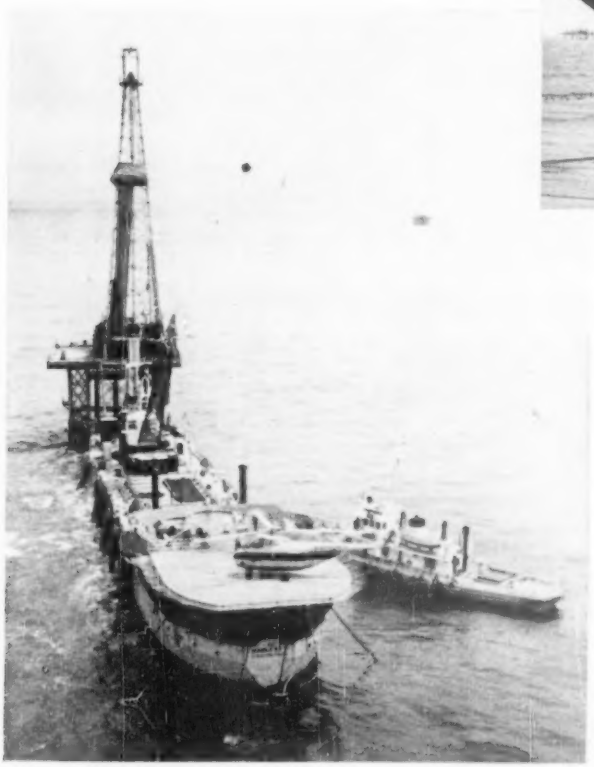
**3.** **THIRTY MINUTES** later the Sikorsky comes in for a gentle landing on the flight deck 45 miles from Grand Isle, Louisiana. By boat, the trip takes tiresome hours.

# Offshore Drilling Barges

Petroleum Helicopters, Inc. of New Orleans, demonstrates how offshore transportation can be speeded . . . how problems can be eliminated or greatly simplified . . . how costs can be reduced. Already as many as 110 men per day fly to work offshore for a major oil company. Intangible values include higher morale, greater safety and availability of an emergency vehicle without peer.

*For information on how your company can increase the efficiency of its operations offshore, or anywhere, with transport helicopters, write on your company letterhead or call today to General Manager, Sikorsky Aircraft, Bridgeport, Connecticut.*

**5.** **PASSENGERS** alight after safe, easy flight. The helicopter makes any number of required trips each day, handling a steady flow of passengers in each direction between several rigs and the mainland.



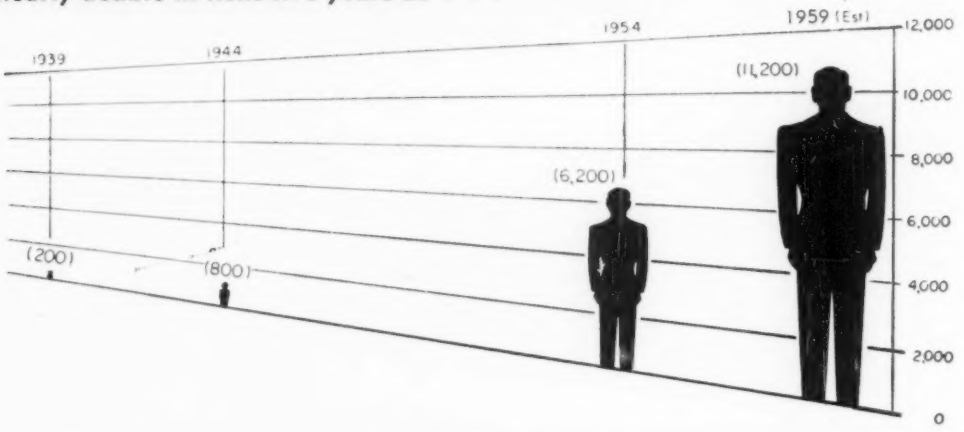
**4.** **CONVERTED LST** with flight deck aft easily accommodates the big Sikorsky helicopter. More and more ships and rigs are being equipped with such heliports. The helicopters eliminate the need—and cost—of standby safety boats at drilling rigs.

Sikorsky Aircraft

BRIDGEPORT, CONNECTICUT

One of the Divisions of United Aircraft Corporation

***Airframe firms' employment of avionics engineers will nearly double in next five years as . . .***




# Battle Over Avionics Dollar Sharpens

By Philip Klass

The established avionics industry, already running into increased competition from within its own expanded ranks, faces the prospect of even more competition from some aircraft manufacturers, particularly on the West Coast. Only the seriousness of this challenge remains open to conjecture.

Within the past few months, large avionics systems manufacturers have often found themselves in direct competition with aircraft firms. In one instance, North American Aviation beat out the field to get a contract to produce the fire control system for a new McDonnell all-weather attack fighter (AVIATION WEEK Nov. 1, 1954, p. 9).

Surprisingly, Radio Corporation of America, itself a major avionics producer, is a subcontractor to NAA on a portion of the system.

In the field of missiles, where airframe companies are already doing a much higher percentage of the avionic work themselves, there is much greater cause for concern, according to the spokesman for one large avionics firm.

► **Up and Going Higher**—It is not hard to find the basis for the new competition. Aircraft manufacturers now employ more than 6,200 avionics engineers, a figure expected to top 11,000 in five years, according to an exclusive AVIATION WEEK survey reported here last week. More than one-third of these engineers are engaged in in-house avionic research and development, the survey indicates.

The trend toward giving aircraft manufacturers more responsibility for avionic systems design, procurement, and integration, which had been rolled back by revisions to the USAF's original Weapons System Management Plan (AVIATION WEEK Dec. 7, 1953, p. 12) may gain new steam from recent Navy moves.

Douglas Aircraft, which had been given weapons system responsibility for the A4D, reportedly has been given similar responsibilities for a new air frame. Another Navy supplier, McDonnell Aircraft, reportedly is anxious to build its new airplane under a similar arrangement.

► **Triple Threat**—The challenge to the established avionics industry comes on three fronts:

- **Systems engineering.**
- **Equipment fabrication.**
- **New competitive devices** coming out of in-house R&D activities.

Systems engineering traditionally has been the responsibility of the larger avionics manufacturer, a responsibility which many of them believe they must hold to assure proper system perform-

***Typifying competitive threat posed by airframe***

CONVAIR . . .

ance. Systems engineering responsibility is not in itself a significant source of income to such a manufacturer. However, it enables him to specify system components which are carefully designed for compatibility, and usually of his own manufacture. Fabrication of these components and subsystems is the major source of his income.

▶**Two Big "Ifs"**—If aircraft manufacturers take over more and more of the systems engineering for such things as autopilots, guidance, and fire control, an avionic systems manufacturer may stand less chance of getting the contract for all portions of the system. This is the case if the airframe manufacturer seeking a fire control system, for example, decides to put out individual specs for the radar, the computer, and the autopilot.

If, in addition, aircraft companies set up to manufacture avionic subsystems themselves, as some have already done on at least a pilot-line basis, the threat is compounded for the large avionics manufacturer and becomes a matter of concern for small ones as well.

AVIATION WEEK's survey shows that more than 2,000 airframe industry avionics engineers are devoting their efforts to in-house R&D. It is logical to expect this sizable effort to produce new techniques, devices, and subsystems which will compete to displace comparable products now designed and produced by established avionics firms.

▶**A Few Examples**—Here are a few airframe industry avionic developments, some of them now in limited production, which are already providing such competition:

• **Automatic navigation computer,** completely self-contained, developed by Ryan Aeronautical as an outgrowth of an earlier missile program.

• **Airborne search radar,** developed by Convair for a prime avionic contractor, is now in pilot production.

• **Fire control system,** including radar, computer, and turret, designed and fabricated by Glenn L. Martin.

• **Automatic landing system** for carrier-based aircraft, and helicopter autopilot, developed by Bell Aircraft Co.

• **VHF communications set** and intercom set, developed by North American's Downey group.

• **Charactron cathode ray tube,** developed by Convair, and now being produced for air defense applications (AVIATION WEEK Nov. 15, p. 77).

There also have been recent announcements of developments in the electronic instrumentation and data reduction fields by Boeing, Chance Vought, NAA, and others. There would undoubtedly be many more disclosures of new avionic developments if it were not for security, since most of the airframe industry's avionics R&D goes into missile programs (45% for missiles versus only 20% for aircraft).

▶**How It Started**—It is doubtful if any of the aircraft manufacturers, excepting possibly Hughes, originally moved into the avionics field with the idea of product diversification. Most of them got into the field after the war as a result of missile contracts, which involved considerable avionics work for navigation and control.

The missile field was so new that there were few if any suitable subsystems or major components available from avionics manufacturers as off-the-shelf items. This, coupled with the need for very close integration of missile airframe, powerplant, and avionics, prompted many airframe companies with missile contracts to start building up their avionics staffs. In some instances, staffs originally organized only to do system integration work later branched out into in-house developments.

Shortly afterward, the numbers and complexity of avionic equipments used in piloted aircraft began to pyramid, and with it the need for integrating all such equipments and airframe into an effective weapons system. This added impetus to the trend which the missile programs had started.

▶**Today's Philosophy**—The Glenn L. Martin Co. probably speaks for a sizable portion of the airframe industry when it sums up its operating philosophy this way:

"Martin . . . firmly believes that the

## Whose Avionics?

**Airframe manufacturers are beginning to make what some observers believe are significant inroads into avionics systems research and development. A few are already in small-scale production on certain avionics systems and devices, particularly in the guided missile field. Their already sizable staffs of avionics engineers are expected to nearly double in the next five years.**

**In this second of three articles, Aviation Week's avionics editor, Philip Klass, reports the details of some of these incursions into the avionics field and the considerations that prompted them. He also reports the possibilities of future expansion by the airframe manufacturers in this field.**

***companies to established avionics manufacturers are these scenes at . . .***

**NORTH AMERICAN AVIATION . . .**

**GLENN L. MARTIN**

# How Much Drag in a Millstone?

**In the highly technical air-world of today, the lack of facilities or "tools of the trade" . . . wind tunnels, physical and research laboratories, electronic devices, . . . is a *millstone* — an unnecessary *drag* on your engineering career.**

**Our physical test laboratory is just one part of a $20 million facilities program designed to eliminate such *millstones* and to provide engineers with a chance to apply their abilities to their best advantage.**

**Engineers suffering from the *drag* of routine assignments and lack of proper facilities are welcomed to discuss with us the opportunities for professional growth and advancement available at McDonnell.**

**Currently needed are: *aerodynamicists, thermodynamicists, designers, stress engineers, dynamicists, flight test engineers, missile electronic engineers, industrial illustrators and artists.* For further information, write:**

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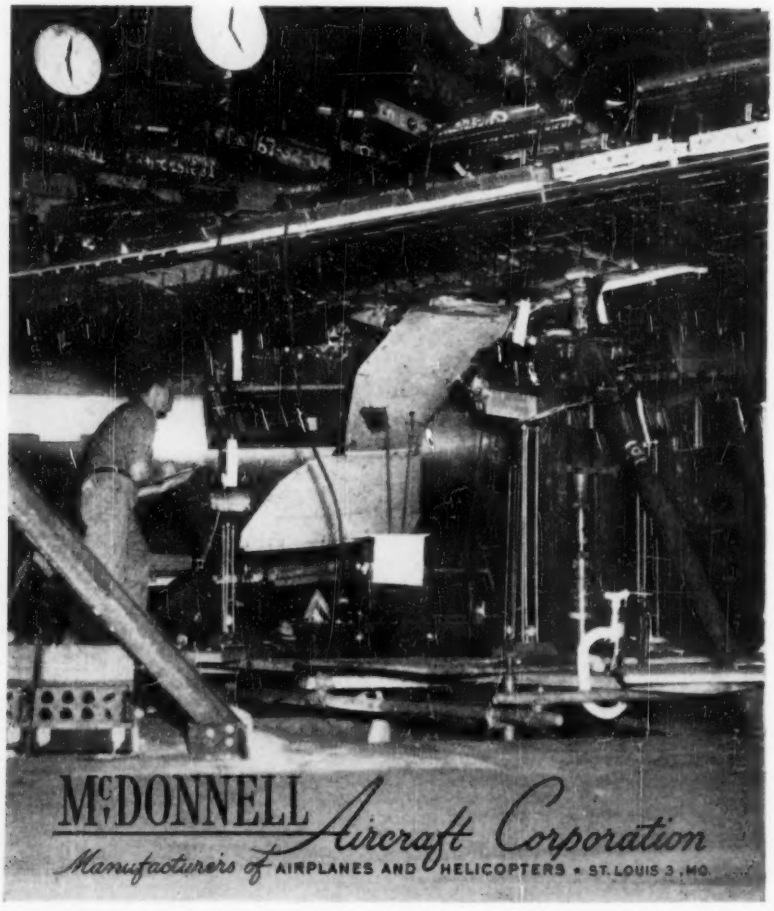
**P. O. Box 516, St. Louis 3, Mo.**





best over-all airborne system will result when the electronics equipment is designed by electronic engineering specialists working side by side with other engineers in the aircraft technical fields. The creation of the electronics department (at Martin) further emphasizes the recognition of electronics as one of the basic sciences contributing to the design of airborne products."

▶ **Industry Concern**—It is little wonder that groans were heard from some segments of the avionics industry last year when the USAF first announced its Weapons System Management Plan, which some feared would aid the airframe manufacturers' avionics ambitions.

Since then, there have been revisions (AF Reg. 70-9), plus reassuring statements from USAF officials, such as that of Brig. Gen. Floyd B. Wood of the Air Research & Development Command.

Speaking in New York last spring, Wood said it is "one of the basic tenets of Air Force policy . . . to avoid building up, at public expense, a capacity on the part of the weapons system contractors to compete unfairly with other established industry" (AVIATION WEEK Mar. 29, p. 42).

However, this says nothing about airframe manufacturers building up avionic capability at their own expense to compete on even terms, or to handle systems engineering problems on missile programs. The latter can frequently serve to launch an airframe manufacturer in the avionics business, as it has at Ryan, Convair, North American, and probably elsewhere.

▶ **How Avionics Grew at Ryan**—Ryan Aeronautical, whose present avionic backlog runs to $5 million, is an excellent example of how the development of a new or improved technique for a missile program enables a company to get its foot in the avionics door. Ryan's backlog includes programs for:

- **Automatic navigation computer.**
- **Missile guidance.**
- **Helicopter hovering control** for anti-submarine warfare use.

Ryan got its start in the avionics field about four years ago as a result of guidance techniques developed previously for its now defunct Firebird (air-to-air) missile. Because of security limitations, Owen Olds, chief of Ryan's avionics group, says only that this was "an old technique made practical by new know-how." (This is believed to refer to improvements in Doppler-type radar.)

By applying these techniques to a navigation computer for piloted aircraft, Ryan has come up with a completely self-contained device which reportedly gives a pilot a continuous indication of his latitude and longitude and enables him to fly to any pre-set

**FLIGHT TEST FILMS OF NEW DUAL PISTON EJECTOR**

**Plane:** North American F86F

**Place:** Edwards Air Base

**Date:** June 10, 1953

**NOTE:**
Hi-Speed camera reveals clean separation accomplished by uniform acceleration, high velocity with low peak force. Operational at transonic or supersonic speeds.

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**NORTHROP F89**
1st production USAF aircraft using Bohanan cartridge-type force ejectors for jettisoning external fuel tanks.

**NORTH AMERICAN F100**
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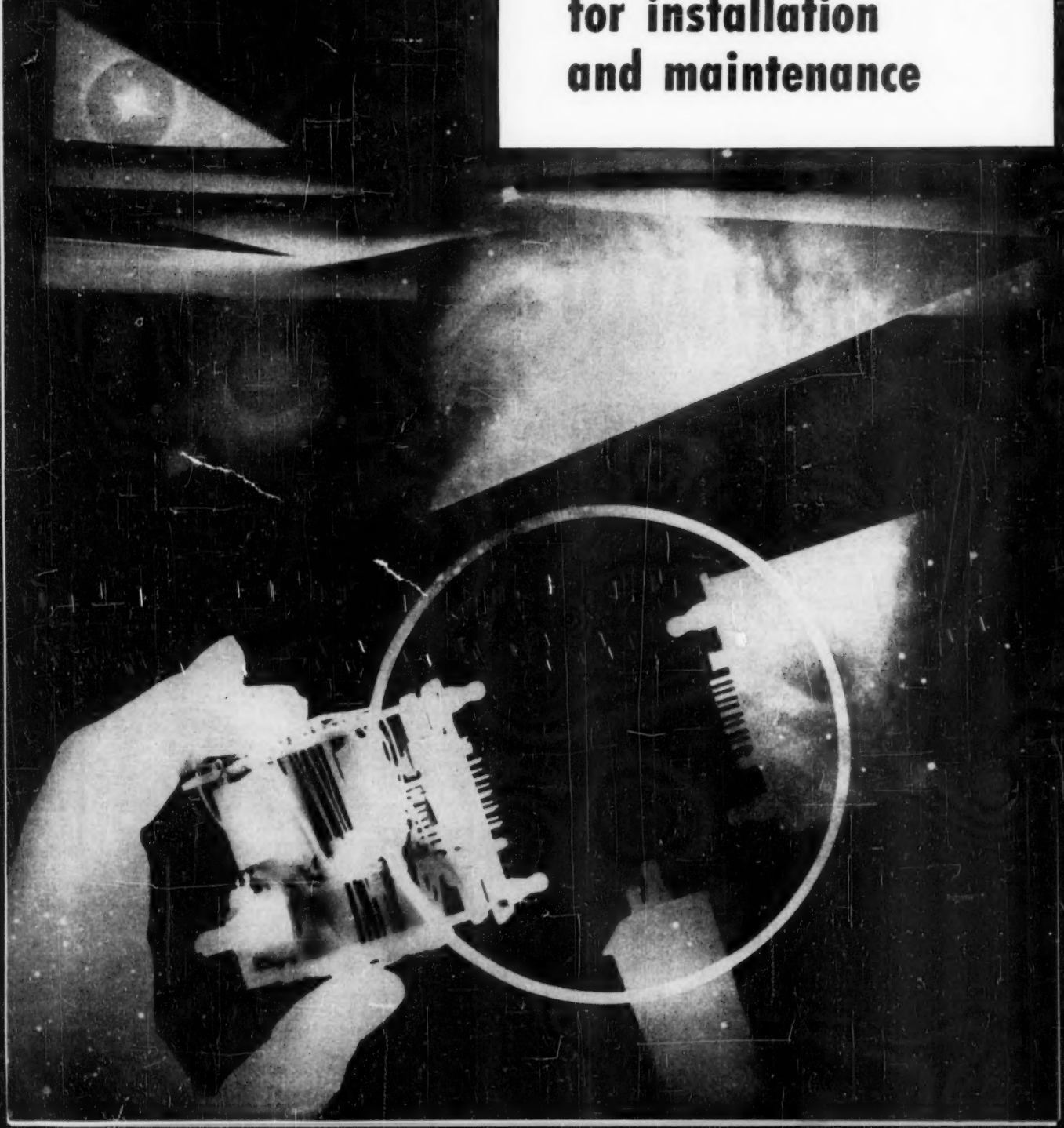
Engineers looking for a future, submit resumé.

TOMORROW'S AIRCRAFT: *One step closer*

**Air Arm Systems "package engineered" for installation and maintenance**



**Quicker installation and easier maintenance** . . . important plus-features for airborne electronics equipment are a reality at Air Arm. The basic Air Arm approach to *all* electronic problems, combined with inherent ingenuity and capability, has led to concepts such as pallet packaging, encapsulated and functional circuitry, built-in test points . . . to mention just a few.

Applying these concepts to all Air Arm systems gives outstanding features . . .

- 100% accessibility
- compatibility with aerodynamic design
- weight and space reduction
- self-contained shock isolation
- simplified airframe design and construction

MAGAMPS, potted units and other proven developments for weight and size reduction are a basic part of the new packaging concepts. Electronic circuits are physically combined and integrated into compact subassemblies—each of which has a single major function. Thus, over-all packages are made up of functional units of complete systems.

This "package-engineering" results from intense Air Arm development and close Air Arm association with the special problems of airframe design and operational requirements. Such achievements in electronic-mechanical design are typical of Air Arm's efforts to bring simplicity and increased reliability into airborne systems, thus bringing tomorrow's aircraft—One Step Closer. Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-91019

MAGAMPS typify the "package-engineering" which Air Arm applies to airborne systems. Simple and reliable as iron and copper, they are a rugged replacement for vacuum tubes. Wherever such packaging is used, maintenance is reduced, circuitry is simplified and systems are far more dependable.

The most advanced state-of-the-art is always brought to bear in Westinghouse design, evaluation and improvement of airborne systems. For example, human engineering studies help technicians perform tasks quickly, simply and surely—thus building the greatest amount of dependability into the system.

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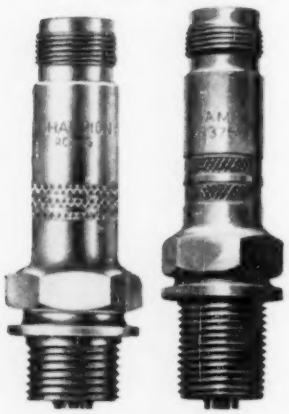
*Champions, of course!*

# Northwest Orient Airlines depends on Champion Spark Plugs to maintain schedules on the Great Circle Route to Manila



*The RC 26S and R 37S-1 are most widely used of Champion's many types of aircraft spark plugs.*

The luxury ships of Northwest Orient Airlines fly the time-saving Great Circle Route to the Orient—providing through service between New York and Manila.

Operating halfway around the globe, Northwest's Boeing Stratocruisers and DC-6B tourist aircraft encounter the widest range of weather conditions, with temperatures sometimes varying as much as 150 degrees F.

To meet these conditions successfully and provide dependable service, Northwest—millions of miles ago—selected Champion Spark Plugs as the most economical and reliable for its entire fleet.

Airline purchases are made only after the most rigid, scientific testing. Every major American airline and most foreign carriers fly Champion Spark Plugs. That's a good fact to remember next time *you're* in the market.

**CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO**

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SPARK PLUGS

destination with good accuracy. (The device possibly is a dead reckoning computer which obtains drift information automatically from a Doppler radar.)

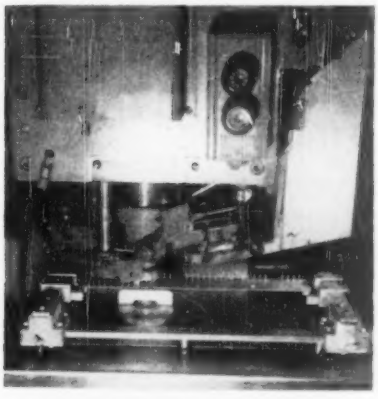
An early model of the auto-navigator underwent service tests by the Navy several years ago. Ryan is currently designing a miniaturized, more versatile model which will be completed next year. Olds expects it to displace equipment made by an avionics manufacturer. Air Force is also interested and has obtained a unit for evaluation.

► **From Navigation to Hovering**—Ryan's helicopter hovering control, which Olds says "involves other very important functions besides hovering," is another outgrowth of the Firebird guidance techniques. The company originally started this development with its own funds, but is now working under Navy contract.

One experimental equipment has been given preliminary tests, with more to follow.

► **Avionics Grows at Convair**—Of the 800 engineers which Convair is seeking in its current engineering staff expansion program, half are for avionics work, according to C. F. McCabe, assistant chief engineer in charge of electronics at San Diego. McCabe sums up the reason for Convair's large avionic expansion this way: if an airframe manufacturer wants to continue to be a prime contractor in future weapons systems, it must get into avionic R&D.

The company is particularly anxious to expand its avionic capability in analog and digital computers, for application to fire control systems and automatic machine tools, McCabe says. Lack of such capability prevented the company from bidding on a super-system job for which it is now building only the radar.



**Automatic Lugger**

**Terminal lugs are installed three times as fast as previously at Glenn L. Martin since company adapted an automatic riveting machine to this use. The machine drills and installs 18 lugs per minute on the terminal board. In old, manual method, involving separate drilling and installation, rate was about six lugs per minute.**

At San Diego, the company currently has three important avionic programs, all Convair-created, according to McCabe:

- **Missile tracking and guidance.**
- **Aircraft homing.**
- **Airborne search radar.**

Most of this work is for USAF, some of it as a subcontractor to another firm. One program is for Navy BuAer.

► **Buy vs. Build**—As the avionics industry sees some aircraft companies going into small-scale avionic production, and more of them making inroads into systems engineering, it wonders whether the airframe people will eventually attempt to build most or all of the equipment themselves. Asked about this possibility, airframe company representatives answer in terms which suggest that they themselves are unsure about what the future holds.

For instance, at Ryan the guiding philosophy is to use the best source for the particular job. For its auto-navigator, Ryan farms out some of the mechanical analog computer elements, but fabricates most of the "pure electronics" itself. Ryan does considerable work in waveguides, duplexers, antennas, and radomes, including fabrication, Olds says. To bridge the gap between R&D and production, Ryan has hired engineers with manufacturing know-how from General Electric and other established avionics firms.

Convair-San Diego, in addition to fabricating "pure electronics," now also is building radar antennas, precision electro-mechanical devices which were previously purchased from an avionics manufacturer. The reason, according to McCabe, is that Convair was dissatisfied with the quality and delivery of production antennas supplied by this outside vendor.

McCabe speculates that the antenna supplier was favoring old-line avionics manufacturers by giving them a higher priority on its design talent. If so, this indicates one of the hurdles which an aircraft manufacturer may encounter in trying to break into the avionics business. It may also indicate one of the reasons aircraft companies are going into the avionics business themselves.

► **Philosophies Elsewhere**—At Northrop, which has an important USAF missile program, a spokesman says the company intends "to manufacture avionic equipment in our own shops, subcontracting certain components as our experience leads us to others who can build to our specifications." The sideship stability augmentor used on the F-89D offers an example. Northrop designed the system, then farmed out the manufacture of much of the hardware to Minneapolis-Honeywell.

Martin reportedly builds practically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***Manufacturers of air-conditioning equipment and pneumatic accessories for high speed aircraft.***


all of the avionics equipment used in the B-61 Matador missile, including ground-based guidance, a representative told AVIATION WEEK. The company has designed and built a complete fire control system, presumably for bomber defense.

At Bell Aircraft, approximately 60-70% of the avionics equipment used in the B-63 Rascal missile is being fabricated within the company, a representative says. He also reports that Bell is looking around for avionics work which it might take on for a prime contractor.

► **Major Threat on West Coast**—Avionic competition from the airframe industry is largely centered on the West Coast, in such firms as Convair, North American, Northrop and Boeing. Martin and Bell are the principal Eastern strongholds. In contrast, companies such as Grumman, Republic, and McDonnell appear to be more content to stick with their traditional responsibilities, employing their smaller avionics staffs primarily for integrating avionics with their airframes.

This was confirmed to AVIATION WEEK by the findings of a prominent autopilot manufacturer who recently surveyed the aircraft industry to determine which companies were planning to design their own automatic flight control systems rather than purchase them from autopilot manufacturers.

There are a few straws in the wind to suggest that some avionics-minded airframe manufacturers entertain ideas of moving outside the military electronics field. Convair, for instance, has its eye on automatic machine tools. A North American spokesman says it is "exploring possibilities outside the government-contracted, military field," as an outlet for its avionics know-how.

► **Countervailing Factors**—There are several important factors which appear likely to act as a restraining force on the movement of the airframe industry into the avionics manufacturing field.

These factors, and steps which some established avionics manufacturers are taking or talking about to counteract the present trend, will be discussed in the final article of this series.

## FILTER CENTER

► **New VOR Equipment Bought**—Central Airlines and Trans-Texas Airways have recently purchased Collins 51R-3 VOR receivers for fleetwide installations. Central Airlines also purchased new Collins 17M-1 VHF transmitters and 51X-1 360-channel VHF receivers.

► **Lear VGI for F3H**—McDonnell Aircraft has ordered for the F3H more than a million dollars worth of new Lear vertical gyro indicators which employ a background sphere painted so as to clearly differentiate between earth and sky (pitch down or pitch up attitude). New type MM-1 VGI uses a remote gyro and is available in either a 3- or 5-in. diameter case.

► **Available Electronic Patents**—A new publication, Electrical and Electronic Apparatus, PB 111468, lists abstracts of 1,915 government-owned patents in the electrical-electronic field, most of which are available for license on a royalty-free basis. Publication, priced at $4.00, may be obtained from Office of Technical Services, U.S. Dept. of Commerce, Room 6227, Washington 25, D.C.

► **Litton Beats 40**—Douglas Aircraft has contracted with Litton Industries to develop an airborne digital computer employing new techniques developed by Litton's Floyd Steele, which reportedly cut size, weight, and cost by a factor of 10 or more (AVIATION WEEK Oct. 18, p. 62). Litton reportedly won out over 40 companies that had submitted bids on the job.

► **First SPARs Delivered**—Lab for Electronics has delivered first two production models of its super precision approach radars (SPARs) to USAF's Air Proving Ground, Eglin AFB, and Rome Air Development Center. First prototype was demonstrated this spring (AVIATION WEEK May 3, p. 54).

► **Constant-Level Read-Head**—Modulator playback head for tape recorders which provides constant-level output regardless of tape velocity can be made from commercial magnetic recording heads by a simple modification developed by Armour Research Foundation. Constant-level output feature makes device useful for time-scale changing and prevents spurious signals during accelerations and intermittent stops of the tape. **–PK**

## Avionics Bulletins

New technical bulletins and catalogs of interest to persons in the avionics field include the following:

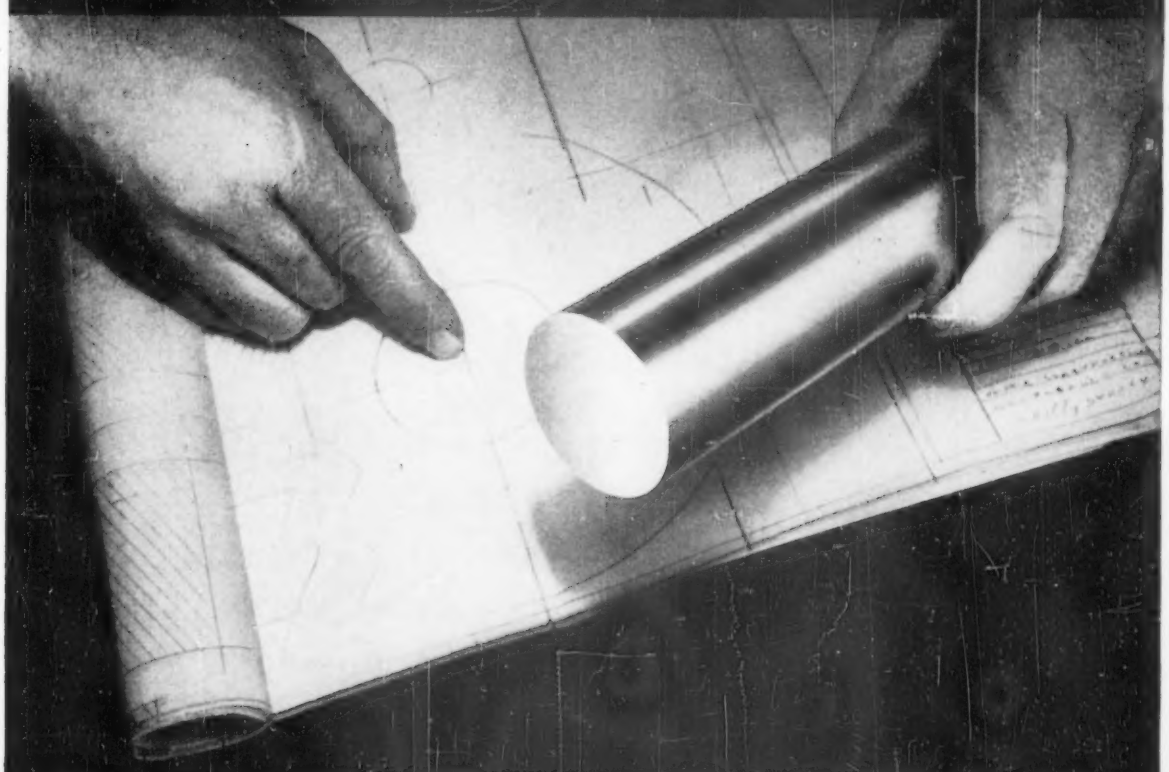
• **Shock and vibration control notes,** new free periodical devoted to shock, vibration and noise isolation problems and their solution, will be published quarterly by the Barry Corp., Watertown, Mass., manufacturer of isolators.

• **Laboratory standards,** more than a dozen different types of meters and instruments for electronics use are described in 60-page catalog available from Measurements Corp., Boonton, N. J.

• **Portable power supply,** Model 71, with continuously variable d.c. output up to 500 volts, regulated to 0.15% for both line and load variation. Bulletin 54-4 gives full details, 4 pp. Lambda Electronics Corp., 103-02 Northern Blvd., Corona 68, N. Y.

• **Precision gear trains,** heads, and speed reducers, for computers and servo systems, 8 pp. Feedback Controls, Inc., 1332 No. Henry St., Alexandria, Va.

# WHY IT PAYS TO BUY ALLOY STEELS FROM US



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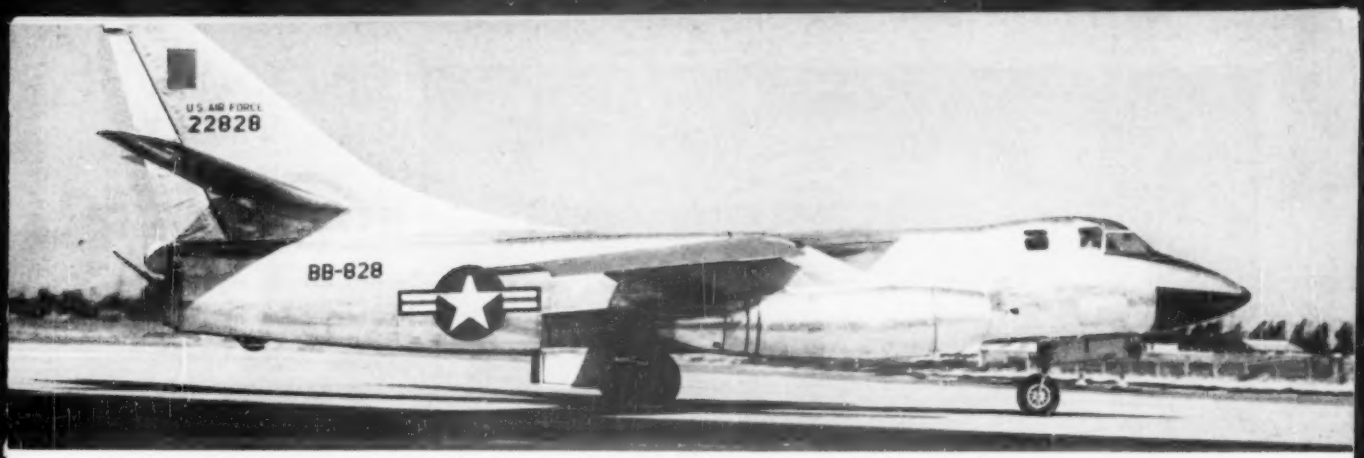
Douglas B-66 takes off at Long Beach, California, for its test run. Its electrical system was designed by G-E application engineers to deliver rated load with 80° C cooling air.

GENERAL ELECTRIC




Side view of bomber shows sleek lines. It is first production aircraft to have an elevated ambient temperature a-c electric system.

# Latest Air Force bomber has new G-E engineered power-generating electric system

## NEW GENERAL ELECTRIC ENGINEERED SYSTEM MEETS DOUGLAS B-66 OPERATIONAL DEMANDS FOR HIGHER AMBIENT TEMPERATURES

A new a-c electric power-generating system has been developed by General Electric, and is now operating on the Air Force's newest light bomber, the Douglas B-66. The system consists of three major components: high-efficiency alternators, static voltage regulators, and generator control and protective panels.

### DESIGNED FOR HIGH PERFORMANCE AIRCRAFT

With a generator that can operate at high ram-air temperatures of high speed flight, the new G-E system is designed for long life and reduced maintenance time. Its static voltage regulator has no moving components to wear out, and under laboratory testing it has withstood 5000 hours of operation without maintenance.

Regulation is preset, and requires no pilot adjustment of voltage or load division. The control panel supplies the automatic control of start-up, shut down, and maximum protection against ground fault, over and under excitation, and open phase.

### SPEEDS TAKE-OFF, SPARES PILOT

The new equipment begins operating as soon as the pilot starts the engine. The system contains only two toggle switches, which may remain "on" at all times, even when a fault develops. This eliminates a series of pilot functions and sharply reduces the time required to become airborne. Under normal conditions, fault clearing and resetting are fully automatic.

### SINGLE SOURCE FOR COMPLETE SYSTEMS

General Electric offers a single source for complete a-c or d-c power generating systems and constant speed drives for most aircraft. For more information, contact your nearest G-E aviation specialist, or write Section 210-92, General Electric Company, Schenectady 5, N. Y.

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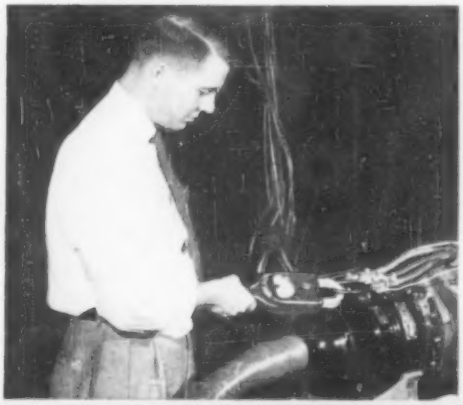
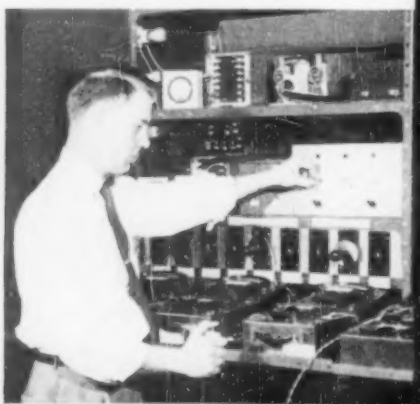
**GENERAL ELECTRIC**

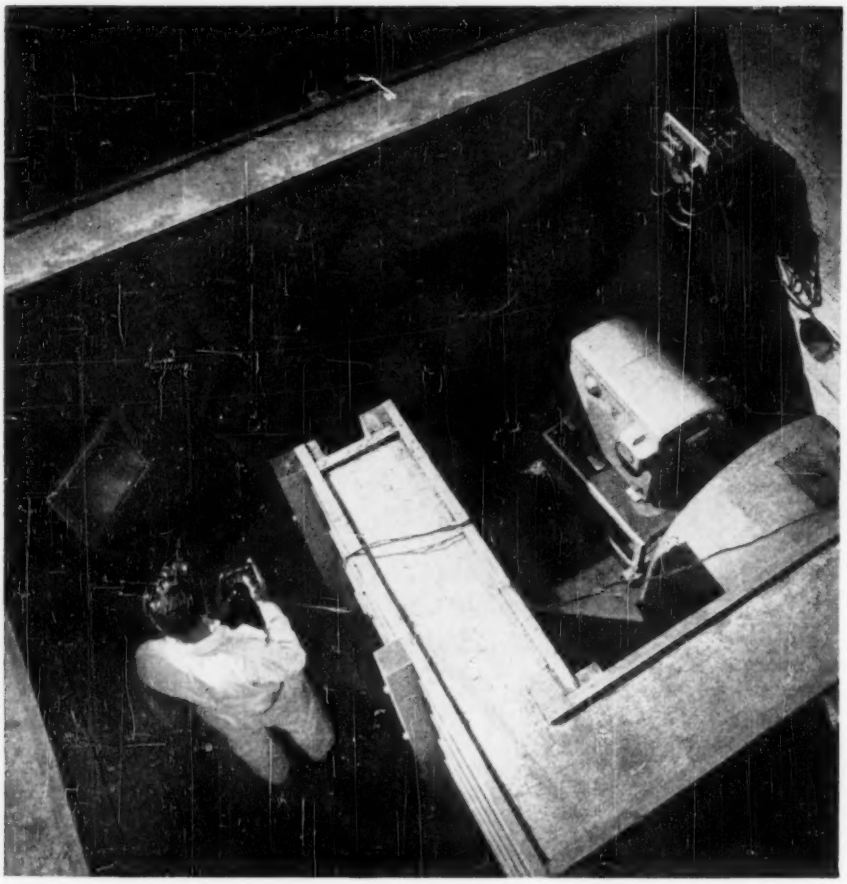
**Static regulator (left) maintains constant alternator output voltage. Control and protective panel (right) helps locate and isolate faulty generation.**

**New G-E high-efficiency a-c generator has no harmonic over 1%; produces full rating when exposed to high temperatures in high speed aircraft.**



**Tests of system showed better protection against over voltage, over and under excitation, ground fault, anti-cycling, difference current, and open phase.**





# *Torture tests prove built-in safety of Solar "Mars" gas turbine engines*

**THREE "LINES OF DEFENSE"** assure absolute safety of every Solar "Mars" gas turbine engine. First, the governor holds the engine at rated speed (36,400 rpm in the unit pictured above). Second, overspeed and overtemperature shutdowns take over if the normal control system should fail. Third, *physical limitations in the engine itself* prevent ruinous overspeeds.

This built-in safety was demonstrated in a special Solar torture test of the Mars. The engine was run up with no load and with all speed and temperature controls disconnected. At 50,050 rpm, speed leveled off because of design characteristics of the compressor and fuel system, and no damage to the power plant resulted.

In addition to its built-in safety, the Solar Mars engine has demonstrated rugged reliability and service life in airborne auxiliary power units. They have logged over 18,000 trouble-free hours with only normal maintenance on the Douglas C-124C Globemaster. Both airborne and ground power units embodying the 60 hp Mars gas turbine are available. Write us, and we'll gladly tell you more about them.

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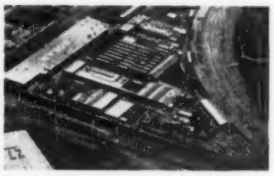

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# All-Around Units Speed Plane Servicing

By George L. Christian

**Stamford, Conn.**—A new multi-purpose, self-propelled ground-support servicing unit for aircraft has been completed by Consolidated Diesel Electric Corp. Although no orders have as yet been received for the new equipment, the company is confident some will develop shortly, since the servicer is felt to meet an important need.

The utility vehicle, produced by Consolidated's Aircraft Equipment Division, is known as the Model 3000. It is designed for one-man operation and provides six services. Tentative cost is $35,000, less than the combined cost of the equipment it replaces.

Consolidated recently received a contract from the Air Force in excess of $20 million for a similar unit—the MA-1. The company has been supplying aircraft ground-support equipment to USAF and Navy for many years.

▶ **Ends Clutter**—When these all-in-one units are used, service cart clutter around an airplane is reduced to a minimum because the unit itself provides six different services.

It can easily go to an airplane, being self-propelled. It is powerful enough to tow the airplane if necessary. Maintenance and manpower requirements are cut sharply because it wraps up various services in one package.

The Model 3000 is completely company-financed, representing a sizable investment. While it was developed specifically for military aircraft, such as the Douglas twin-jet B-66, Norman Schafler, Consolidated's president, told AVIATION WEEK that he soon expects to initiate development of similar equipment for commercial airline use.

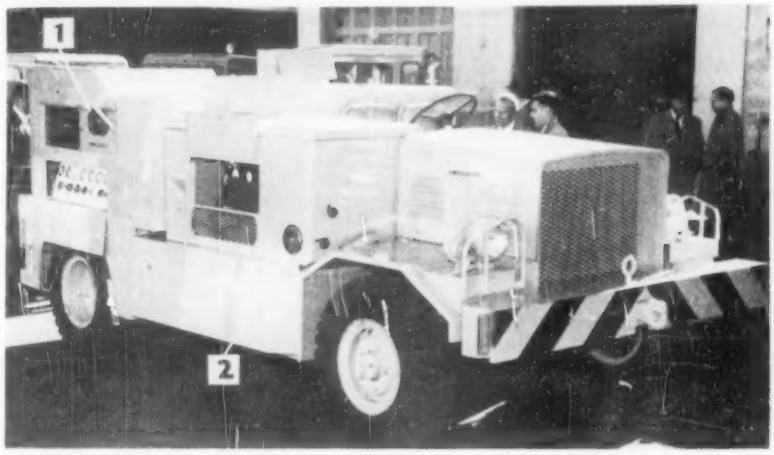
▶ **Six Services**—The one-man-operated Model 3000 provides these services:

• **A.C. electrical power**—60 kva. of 115/200 v., three-phase, 400-cycle power at a power factor of .75, very closely regulated, plus provisions for 20-kva., single-phase, 115-v. power. The a.c. power is used to check out such items as an airplane's instruments, computer and fire control systems.

• **D.C. electrical power**—28.5 v., 500 amp. continuous, overload rating of 1,200 amp. Direct current may be used to test the aircraft's various d.c. services such as communications systems and lighting circuits and can be used to start engines equipped with electric motor starters.

• **Pneumatic power, high pressure**—3,500 psi. at 13.5 cubic ft./min. Power

**MODEL 3000**—(1) Air intake for gas turbine; (2) turbine; (3) turbine exhaust stack.




**OTHER SIDE**—(1) Low-pressure (50 psi.) air outlet; (2) cooling air outlet.

**MODEL MA-1** ground-support servicing unit. USAF bought nearly 1,000 of these.

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supply includes a 1,500-cu. in. receiver. High pressure air is used to fill an aircraft's air receivers, service struts and tires.

• **Pneumatic power, low pressure**—50 psia. at 110 lb./min. at 375F. Low-pressure air is used to start aircraft equipped with pneumatic engine starters and drive the unit's air-cycle cooling equipment. A compact AiResearch gas turbine supplies the low-pressure air. It reaches maximum output in 14-18 sec.

• **Refrigeration**—An air-cycle refrigeration machine provides 94 lb./min. of air at 40F, 3 psi., on a 100F day. Lowest temperature capacity is —12F. A modulating valve keeps air at any desired temperature within the operating limits of the machine. Refrigerated air cools a plane's cockpit and electronic compartments while ship is on the ground. The refrigeration machine is a modification of a standard B-47 cooling unit.

• **Towing**—Drawbar pull is 10,000 lb. (enough to tow a 100,000-lb. airplane).

Model 3000 is powered by a 165-hp. Ford V8 engine and weighs 7 tons. It incorporates a torque converter and has two forward speeds and one reverse.

► **Model 3000 Details**—Electrical a.c. and d.c. power supply cables in the Model 3000 are 30 ft. long and are stowed in the servicing unit. Cables are provided with "Chinese handcuff-type" fittings at the cart end which mechanically link the cables to the service unit's frame. This is so cables won't be torn out by the roots if someone inadvertently drives the vehicle off without disconnecting it from the airplane being serviced.

Dual rear wheels and four-wheel drive provide maximum traction when unit is used to tow heavy aircraft and allow it to maneuver through snow and mud.

All components are easy to remove and replace, simplifying maintenance of the unit.

Among the components built into the unit are an oil reservoir and control panel for the gas turbine; Wiggins air connections to the aircraft, and high-pressure air compressor control panel.

► **Model MA-1**—Predecessor of the Model 3000 is the Model MA-1 multi-purpose ground servicing unit. The recent USAF order for MA-1s was for 940 units; the firm also has supplied 675 somewhat simpler ground support units (Model NC-5) to the Navy.

Here is what the MA-1 can supply in the way of power:

• **A.C. power**—60 kva. of 115/200-v., three-phase, 400-cycle.

• **D.C. power**—28.5 v., up to 2,250 amp.

• **Hydraulic power**—Up to 5,000 psi.; an oil cooler is incorporated in the hydraulic power supply system.

• **Pneumatic power**—Up to 3,500 psi., at 13.5 cfm. A 1,000-cu. in. reservoir is provided in the pneumatic system.

• **Towing**—Machine is capable of towing aircraft weighing up to 60,000 lb.

The MA-1 is also powered by a Ford V8 engine. It has a four-wheel drive and comes either with a mechanical transmission or a torque converter. The vehicle has a turning radius of 18 ft.

► **Design Niceties**—Here are some examples of the attention to detail paid by Consolidated Diesel engineers to the MA-1 design:

• **Engine exhaust** is at cab-top level to prevent heat or sparks from igniting fuel puddles on a ramp.

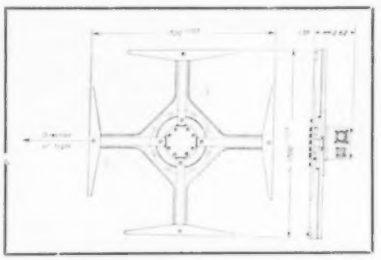
• **Blackout lights** have been provided fore and aft to avoid destroying night vision of pilots waiting in planes around which the vehicle is moving. Lights also make the machine ready for service under combat conditions.

• **Eyes at the corners** of the chassis provide hoisting and tie-down attach points.

• **Slave plug-in** is located on right side of the vehicle so that outside power can be plugged into the unit in case its own battery goes dead.

• **Rear deck** over control panel is strong enough to hold several men, thus providing a platform for them to stand on to reach high up on an airplane.

• **Tail gate** is built to accommodate the



## New Flush Antenna

**This engineering drawing is of the LPA-70A the flush-mounted loop antenna recently released to production by Bendix Radio. The antenna, which mounts horizontally, will be used with Bendix ADF systems. It will work equally well with existing equipment in the field or with new equipment coming out next summer (such as the Bendix ADF-70), says the company. The four collector bars radiating from the center of the antenna are made of a special ferrite compound, as are the compensating bars teeing off the ends of the collector bars. Purpose of the latter is to correct for quadrantal errors produced by the aircraft. On the Vickers Viscount installation, ends of the compensator bars had to be curved inward to allow the antenna to fit within the 17½-in. space Vickers allowed in the airframe. This is the third major design change made to the antenna before it was released to production.**

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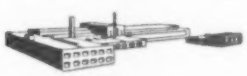
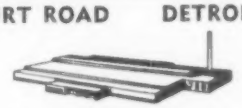


**PLANT 2**
Detroit, Mich.



**PLANT 3**
Hillsdale, Mich.

**PLANT 4**
Hillsdale, Mich.

30 ft.-long electrical power lines quickly as the vehicle moves from one plane to another.

• **Large windows** have been provided all around giving maximum visibility to avoid collisions with aircraft. Windows in the top make checking wing clearance easy. Windshield wipers have been installed on front and rear windows.

• **Unit has spotlight** with 360-deg. swivel; large fire extinguisher; tow hook on the rear.

► **Company History**—Consolidated Diesel Electric Corp. was formed in 1942 by Schafler and a partner. Principal work was assembling motor-generator sets for the armed forces.

In 1949 Schafler bought out his partner and became president of the company. Shortly thereafter, he won a contract from the Navy for the NC-5 self-propelled units.

In the fiscal year ending July 31, 1950, Consolidated Diesel did a business of under $800,000. This grew to $4.5 million in 1952, while 1953 saw the firm's business pass the $8-million mark. In 1954, volume exceeded $10 million and sufficient backlog exists to assure a 1955 sales volume figure of approximately $20 million, Schafler says.

Among products made by the company are gasoline and diesel engine-driven a.c. and d.c. generator sets with power outputs ranging from 5 kw. to 200 kw., skid or trailer mounted; self-propelled magnetic airport and runway "sweepers," guided missile launching and servicing equipment and engine-driven floodlight units.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## OFF THE LINE

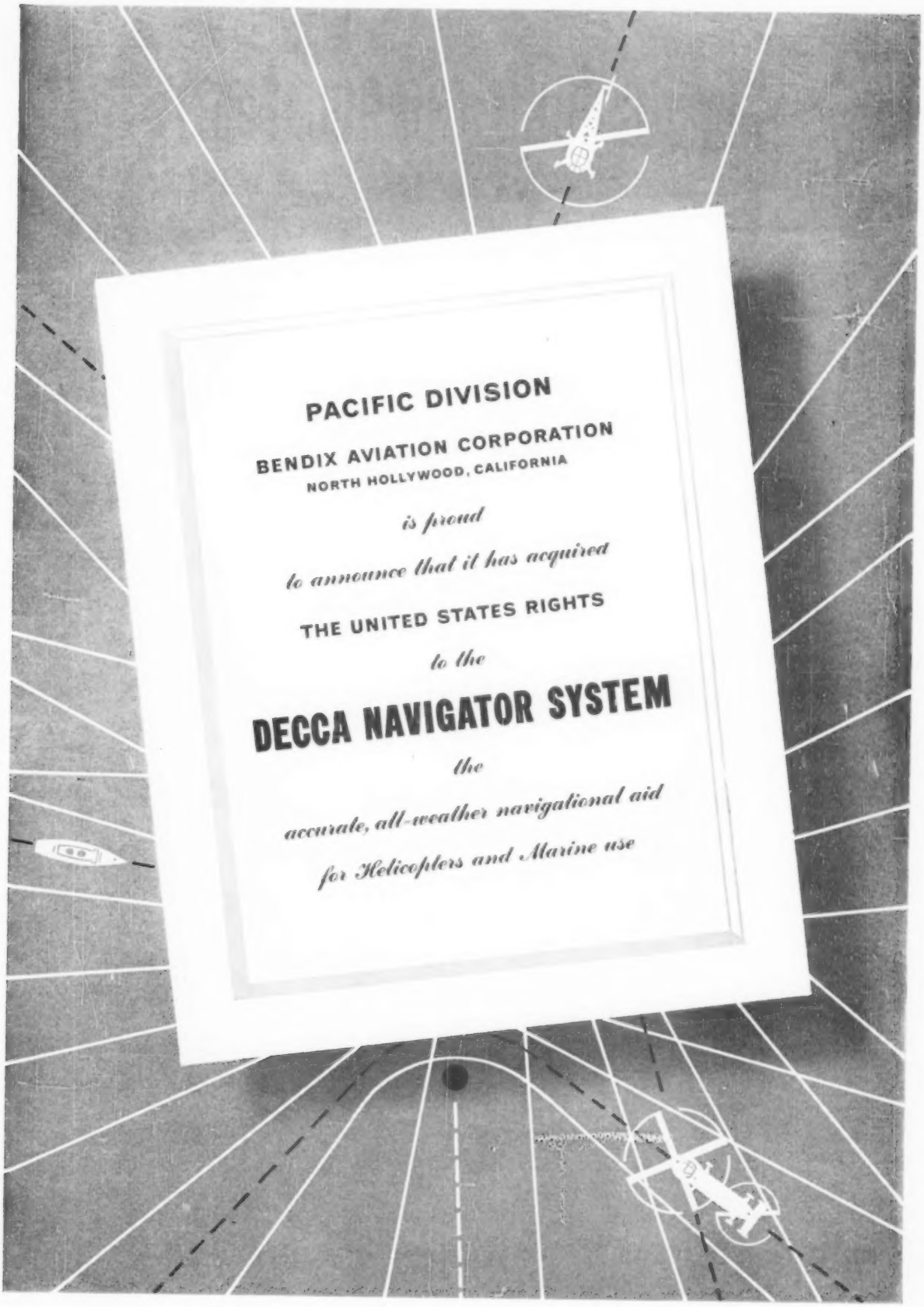
**Contract to modify and repair 32 C-54s** has been received by Pacific Airmotive's Chino (Calif.) division. The contract is under the Air Force's IRAN (Inspect and Repair as Necessary) program. PAC is currently overhauling and repairing 123 C-47 and C-117 aircraft for the Air Force, the company states. . . . A $300,000 contract to modify Air Force RB-50s has been received by Aircraft Engineering & Maintenance Co. Work, which will be performed at the company's Oakland base, includes extensive cabin modifications to 13 aircraft to equip them for specialized missions. AEMCO, a subsidiary of Transocean Air Lines, is presently overhauling and maintaining T-33 and F-94 jets and aviation ground units for USAF. Company has a $6-million backlog.

**Overhaul period of Pratt & Whitney** R-4360-63A Wasp Majors has been extended from 1,000 hours to 1,200 hours by the Third Air Transport Squadron, Brookley AFB, Ala., according to P&WA. The engines are installed on Douglas C-124 Globemasters.

**New heater exhaust repair kit** to repair Janitrol series 88-A-92 combustion heaters has been put on the market by Hardman Tool and Engineering Co. Firm says that the kit (already used extensively by a major airline) allows heaters to be repaired at a fraction of the cost of a new heater and prolongs the heaters' life several times. Address: 1845 South Bundy Drive, Los Angeles 25.

**Bristol's four-engine turboprop-powered** Britannia transport will use Monsanto's new low-temperature, fire-resistant hydraulic fluid, Skydrol 500, according to qualified sources. . . . A new booklet on Skydrol is available from Monsanto Chemical Co.'s Organic Chemicals Division, St. Louis 4, Mo.

**Navco, Inc. has moved into a new** air conditioned sales office and shop, which gives it an additional 13,000 sq. ft. on the premises of its present warehouse at Lambert Field, St. Louis. The company is a distributor of aircraft parts, radios and supplies for executive aircraft.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## OVERSEAS SPOTLIGHT

### Italy's Share of Offshore

ROME

Italian industry received U. S. offshore procurement orders for more than $45-million worth of aviation supplies in the three years from July 1951 to July 1954. In addition, orders were given for more than $31-million worth of electronic equipment, mostly slated for aviation and anti-aircraft uses. Among the contracts:

- **Aerfer,** Republic F-84 parts, $11,803,246.
- **Fiat,** Allison J35 turbojet parts, $9,329,114; assembling North American F-86s, $22,500,000.
- **Filotecnica Salmoiraghi,** instruments, $89,365.
- **Italjet,** takeoff assist rockets, $1,357,722.
- **Piaggio,** overhaul of aircraft engines, $82,800.
- **Siai-Marchetti,** overhaul of aircraft engines, $307,500.

### Miles Studies French Wing

PARIS

Hurel-Dubois is building a high-aspect-ratio wing for test on the Miles Acrovan light cargoplane, similar to the wing which has enabled the H.D. 32 to carry greater loads and use shorter runways than conventional transports.

French sources say the British government is interested in the progress of this project.

### Fiat in Trouble

ROME

The Fiat company has dismissed 570 workers employed in its aircraft division, Aeritalia.

According to the Italian press, this confirms reports of a serious situation at Fiat's Aeritalia and Heavy Engine shops, due to lack of sufficient orders. The company is said to be considering winding up its aeronautic department.

### Canadair Picks U. S. Bond

LONDON

Canadair, Ltd., has decided to use an American adhesive—Bloomingdale FM-47—in bonding applications on the C.L. 28, maritime reconnaissance version of the Britannia which it is building under license from Bristol.

The Britannia makes extensive use of adhesive bonding in its makeup (AVIATION WEEK June 7, p. 48). As built by Bristol, the British process of Redux bonding is used. Choice of an American adhesive is in keeping with Canadian policy of looking for supply sources on the North American continent, but it has occasioned disappointment in the British aircraft industry, observers state.

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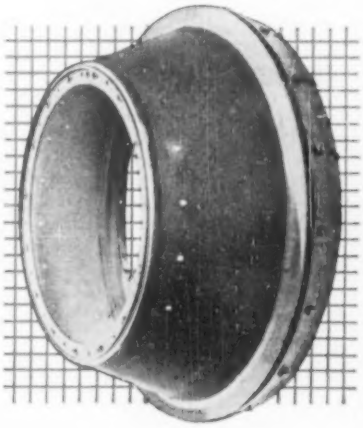

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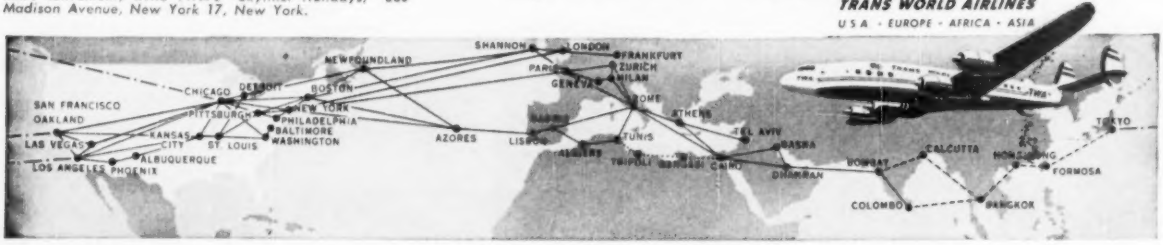


# NEW AVIATION PRODUCTS

**TANK-TYPE** filter sits behind cab of $17,000 fueling truck at Idlewild Airport.

## Fuel Filter Traps Water, Fine Dirt

New aviation fuel filters, manufactured by Purolator Products, Inc., are being introduced at numerous commercial airports. One of the principal purchasers of the equipment is Allied Aviation Fueling of New York, Inc., which is installing the Purolator units in automotive fueling equipment used at New York's International Airport and at Fort Worth's Amon Carter Field.

Already standard equipment at most USAF fields and supply bases, the filters come in various sizes, ranging in capacity from 50 to 1,200 gpm.

Units used by Allied are the Purolator F-6, tank-type. These contain 14 Purolator accordion-pleated, resin-impregnated micronic paper elements with a total filtration area of 39,200 sq. in. These elements filter out all solid particles measuring down to microns. At least 99% of all entrained water is also removed, according to Purolator.

▶**Water Trap**—The F-6 unit also has a built-in sump, containing automatic water dump valves. When a certain amount of water has collected in the sump, an automatic switch stops the flow of gasoline until the excess water has been completely drained off, at which point fuel flow is automatically resumed.

The F-6 units have a capacity of 300 gpm. with a 1½ lb. pressure drop. They are 5 ft. high and 25 in. in diameter.

At Idlewild airport, Allied uses the F-6 units on new $17,000 fuel trucks. On these trucks, the filters, as well as all other pumping components have been taken from their scattered locations beneath trailer and cab and consolidated directly behind the cab where they are easily reached for maintenance.

At Amon Carter Field, the F-6 units are mounted on vehicles called Avigassers, which serve as mobile intermediary pumping stations between fuel pits in the ramp and the airplane. Units are equipped with special switches which make it impossible to start the vehicles unless all hose is in place, making it impossible to drive off while still coupled to a hydrant.

## New Vehicles Speed Up Materials Handling

Three new vehicles for speeding materials handling, making most efficient use of costly warehouse space and increasing pace assembly line operations have been developed by Automatic Transportation Co. The new plant aids:

- **A rider-operated stacker,** the ESRT Transveyor, having a retractable mast and fork assembly and especially designed for tiering and de-tiering in narrow aisles.
- **A Uni-Grip tractor,** which the maker notes is the only one of its kind that will couple to any industrial trailer without use of special adaptors.
- **A U-shaped load ram** incorporating full-vision so that the operator does not have to lean out over the side to see where he is going.

▶**Stacker**—The ESRT Transveyor stacker can work in aisles only 6½ ft. wide. Its retractable fork and mast assembly extends and retracts 36 in. and can carry 4,000 lb. with pallets up to 48-in.

Since the mast and fork are integral parts of the truck, and are not attachments, distortion and sagging and the resulting extra maintenance and service are absent, the maker reports.

Using the ESRT, operators can right-angle-stack in a 6½-ft. aisle with a 36x48-in. load. One-hand control grouping includes forward and reverse, fork lift, extension and retraction. The vehicle has a standard fork lift of 130 in. with 83-in. mast. Maximum battery size usable without changing truck dimensions is a 6 MEH-13 or 106DA.

▶**Uni-Grip Tractor**—This vehicle will couple to any trailer of 5½ to 12¾-in. floor clearance, according to Automatic, covering most factory units. A hydraulically operated draw-bar gripping tip, which extends 10 in. beyond the tractor's length, is guided into position beneath the trailer and then raised. As soon as the weight of the trailer exerts a pre-determined pressure on the bar, it automatically retracts, drawing the trailer tightly to the tractor's buffer plates.

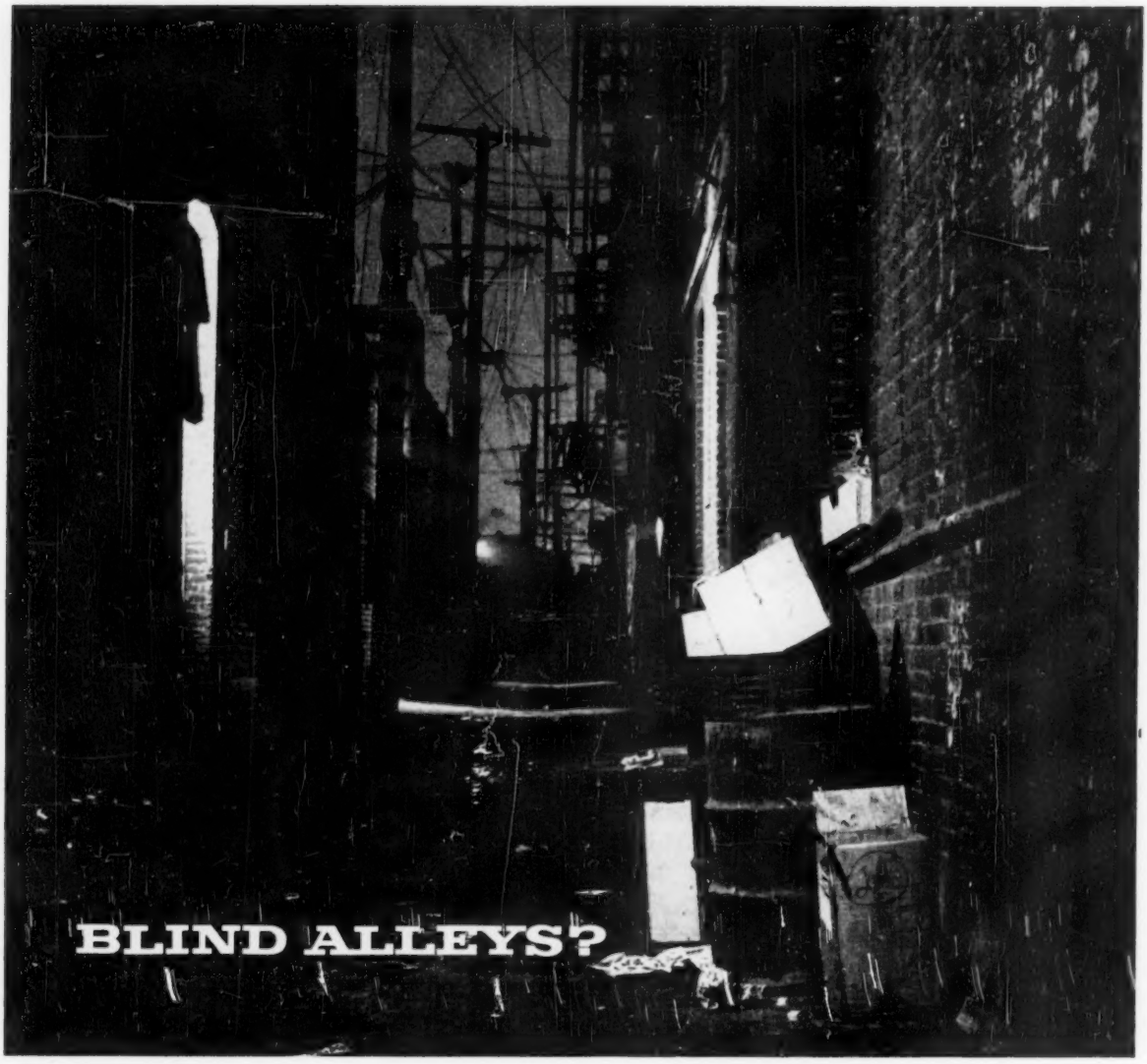
Simultaneously, the fixed wheels at the draw-bar end of the tractor are retracted and the caster wheels lowered. Fixed wheels are used when the Uni-Grip is unloaded; caster wheels when the load is being pulled. The entire operation takes a couple of seconds and is done by pressing a button the the operating handle. Maximum trailer load is 0,000 lb.

▶**Cantilever Ram**—A U-shaped cantilever load ram, the first of its kind ever developed, the manufacturer states, is the feature that gives the driver full sight control of his vehicle when laden.

The cantilever is part of the industrial truck on which the fork or ram is raised and lowered. Previously cantilevers were made of one solid plate, limiting visibility. In the new design, the center of the plate is cut out. This full-vision ram is available on all of the company's giant-series trucks.

Automatic Transportation Co., 149 W. 87th St., Chicago 20, Illinois.

**UNI-GRIP TRACTOR** couples to trailer.

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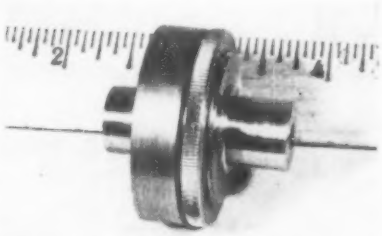
Standard Signs, Inc., 3190 E. 65th St., Cleveland 27, Ohio.



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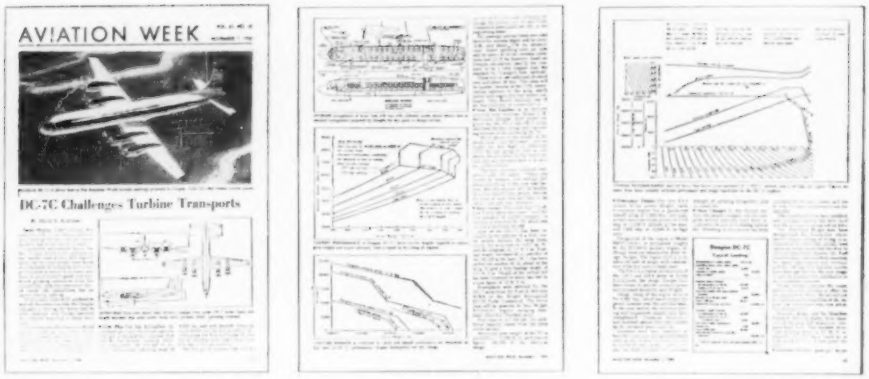


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**DAVID A. ANDERTON,** AVIATION WEEK's senior Engineering Editor, holds a Bachelor of Aeronautical Engineering degree from Rensselaer Polytechnic Institute, and has completed additional post-graduate studies at Princeton University and Union College. His professional experience began in 1941 with Grumman Aircraft Engineering Corp., where he was a production group leader on wing design of the TBF-1 torpedo bomber. While at Grumman, Mr. Anderton served in various capacities as Liaison Engineer Between Grumman and Eastern Aircraft Division of General Motors Corp.; in work on aircraft performance and powerplant problems in Grumman's Aerodynamics Department; and in Grumman's Preliminary Design Group on pioneering work with jet aircraft layouts. After his work at Grumman, Mr. Anderton served as Aerodynamicist for the Lark guided missile at Ranger-Lark Division of Fairchild Engine & Airplane Corp.

Mr. Anderton joined the General Electric Company in 1946, on GE's Hermes guided missile project. During his first 14 months with GE, he worked alone on preliminary design for a long range rocket missile. He was then named Project Engineer on GE's Hermes B missile with responsibility for its overall design and successful functioning. After completing his work on the Hermes project, Mr. Anderton joined the editorial staff of AVIATION WEEK.

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Mr. Anderton is a member of the Institute of the Aeronautical Sciences, Society of Automotive Engineers, American Rocket Society, Sigma Xi (national honorary engineering society), and Aviation Writers Association.

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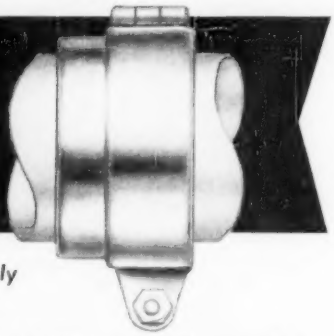

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## The Airlines Bounce Back

COMMON STOCKS

| | 1945-1946 High | 1948-1949 Low | Dec. 31, 1953 Close | Recent* High | Percent Increase 1954 |
|---|---|---|---|---|---|
| American | 19 | 6 | 11⅛ | 21⅜ | 90 |
| Braniff | 37 | 6 | 6 | 16¼ | 171 |
| Capital | 49 | 4 | 8⅜ | 19⅞ | 131 |
| Colonial | 45 | 3 | 11½ | 17 | 48 |
| Continental | 29 | 5 | 6¾ | 11 | 62 |
| Delta | 69 | 12 | 19½ | 28 | 44 |
| Eastern | 33 | 13 | 22⅜ | 40 | 79 |
| National | 41 | 5 | 13⅞ | 23 | 66 |
| Northeast | 25 | 2 | 4½ | 5⅞ | 31 |
| Northwest | 63 | 7 | 8½ | 17¼ | 102 |
| Pan American | 29 | 8 | 9¾ | 18 | 94 |
| TWA | 79 | 9 | 12⅞ | 27½ | 114 |
| United | 62 | 10 | 21⅜ | 36¾ | 69 |
| Western | 40 | 5 | 8¾ | 17¼ | 97 |

NOTES: All fractions eliminated from first two columns. † Adjusted for recent 5% stock dividend. * Up to Dec. 9, 1954.

# Stocks' Base Is Firmer This Time

**Investors are now evaluating transport equities more realistically than in 1945-46 speculative boom.**

Airline equities started the year in extreme investor disfavor, but are winding up in a wide burst of market enthusiasm.

In reviewing the low market evaluation of the air transport industry early in 1954, it was noted in this space, (Feb. 22, p. 51) that:

"Market quotations for airline securities have been known to swing from one extreme to another—first taking a too liberal view of the future, then too dark. A process of 'over-discounting' may be taking place now."

▶ **Wide Swing**—The industry recovered from the adverse first quarter with its attendant deficit operations. As improving traffic was translated into rising earning trends, the market was quick to reflect this action by sharply marking up prices for most airline equities. As a result, one of the widest swings in airline market quotations has taken place in recent months.

The table above reveals an interesting study in contrasts for airline market prices during 1954. Significant comparisons are also afforded with the high-water marks generally reached during the 1945-1946 boom and the low points generally established during the year of 1948 and 1949.

It can be seen that from the 1953 close, the equities of Braniff, Capital, TWA, and Northwest have more than doubled, ranging from increases of 171% down to 102%. The Braniff rise (171%) is accentuated by the compounded difficulties of that carrier which drove the price of its equity to an abnormal low level in 1953 and early 1954. The sharp improvement in Capital's stock may be partially attributed to the assist engendered by its equipment plans.

▶ **Only Two Records**—In taking a broader view, it is most significant that the equities of only two airlines have been able to surpass their previous all-time peaks established some eight or nine years ago. Eastern's equity, by selling at $40 per share recently, reached a point some 20% higher than its previous top, (33½), established in 1945.

American's common recently drove past its former peak by a comfortable margin. American's preferred, moreover, also displays a dynamic price recovery. At one time, in 1948, this senior equity sold as low as $40 per share. It was able to recover to $93 in 1951. Recently it reached $105 per share for an all-time peak. Convertible into common, American's preferred is quick to reflect price fluctuations in the junior equity.

Interesting contrasts prevail in the spreads that exist between current quotations of the other airline equities and their former peak prices of 1945-1946.

With but few exceptions (and excluding Eastern and American), the average of current quotations is around at least 50% of the best previous market prices. United is a notable exception. Largely through conversions of its previous preferred stock issues, its equity submitted to considerable dilution. In other words, from some 1.6 million common shares outstanding,


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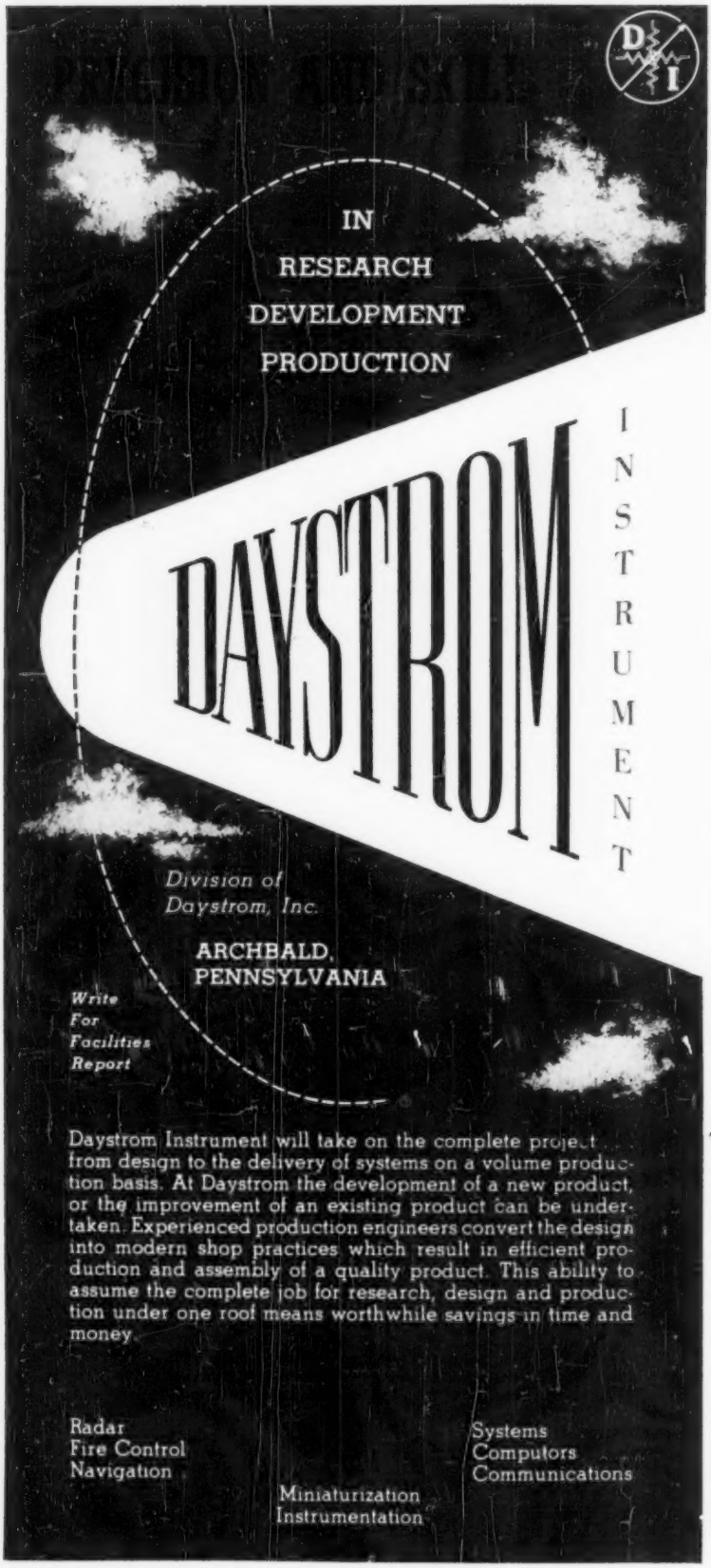
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United's junior equity increased to about 2.5 million shares at present. The larger number of shares outstanding is a factor to be considered in measuring price movements.

The wide distances remaining between past peak quotations and present market prices for most of the airline equities, does not mean these gaps are to be closed in the same manner as accomplished by Eastern and American.

▶**Water and High Water**—The high-water marks of eight and nine years ago were just that—quotations of the day contained considerable water in the indiscriminate hopes and expectations read into the airline industry by frenzied speculation.

Little regard was accorded a realistic measure of earnings to be attained by the industry—price-earnings ratios from 20 to 50 were not uncommon. There was no disposition to view the individual positions, route structures and the host of other elements which determine an airline's outlook with any particular discrimination.

The passage of time tended to cure many of these price disparities. Many investors today, for example, realize the importance of the difference in a subsidy-free carrier from one that is still dependent upon the government for support. (This is borne out by the failure of local-service airline equities to participate in this recent market boom for air transport securities.)

Also, many investors show a disposition to inquire as to airline management, traffic densities, competitive position, the status of equipment, etc.

▶**Debt and Declines**—There is considerable leverage in airline operations. A wide segment of operating costs does not readily permit material cutbacks in periods of declining business. Further, in many cases the measure of debt imposes relatively large prior charges on the operating revenues of the industry. It is these factors which may introduce major elements of instability on airline operations, i.e., traffic declines tending to magnify earning shrinkage.

It was a reflection of this condition that later drove airline equities to their all-time lows generally established in the 1948-1949 period.

These very same conditions inherent in the leverage factor, however, cause earnings to mount very rapidly during periods of rising traffic volume. Once a breakeven point is reached, the major portion of all additional revenues generally flows through to net.

The volatile character of airline earnings, and the conditions influencing operations, introduce wide disparities in the market fluctuations of the industry's securities. For this reason, selectivity among the individual issues remains of paramount importance as a guide to investment.—**Selig Altschul**

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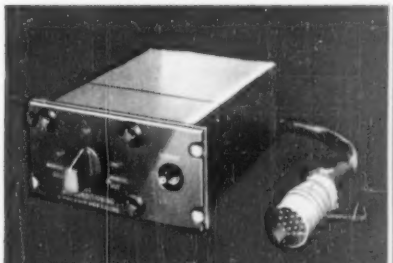

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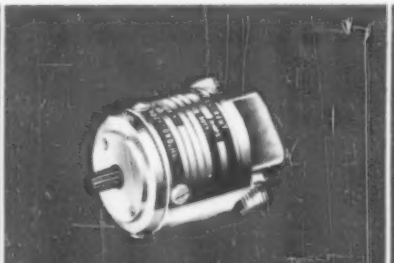

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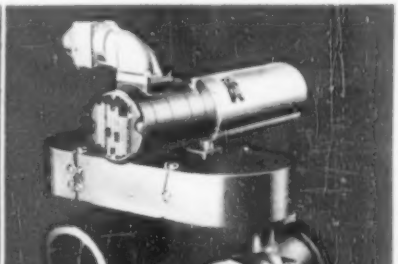

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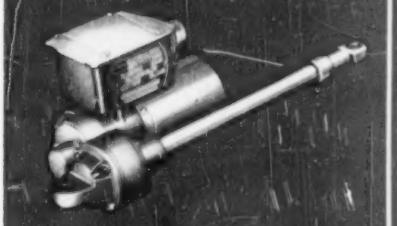
Barber-Colman offers a wide variety of electrically actuated air valves for use with temperature and pressure control applications. This dual 2" valve assembly solved a difficult sequencing problem.



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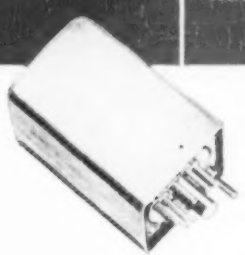

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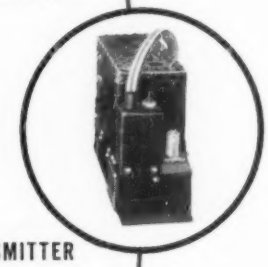
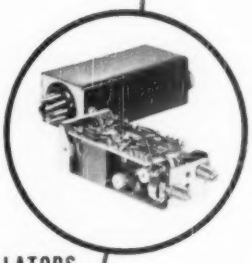


TRANSMITTER



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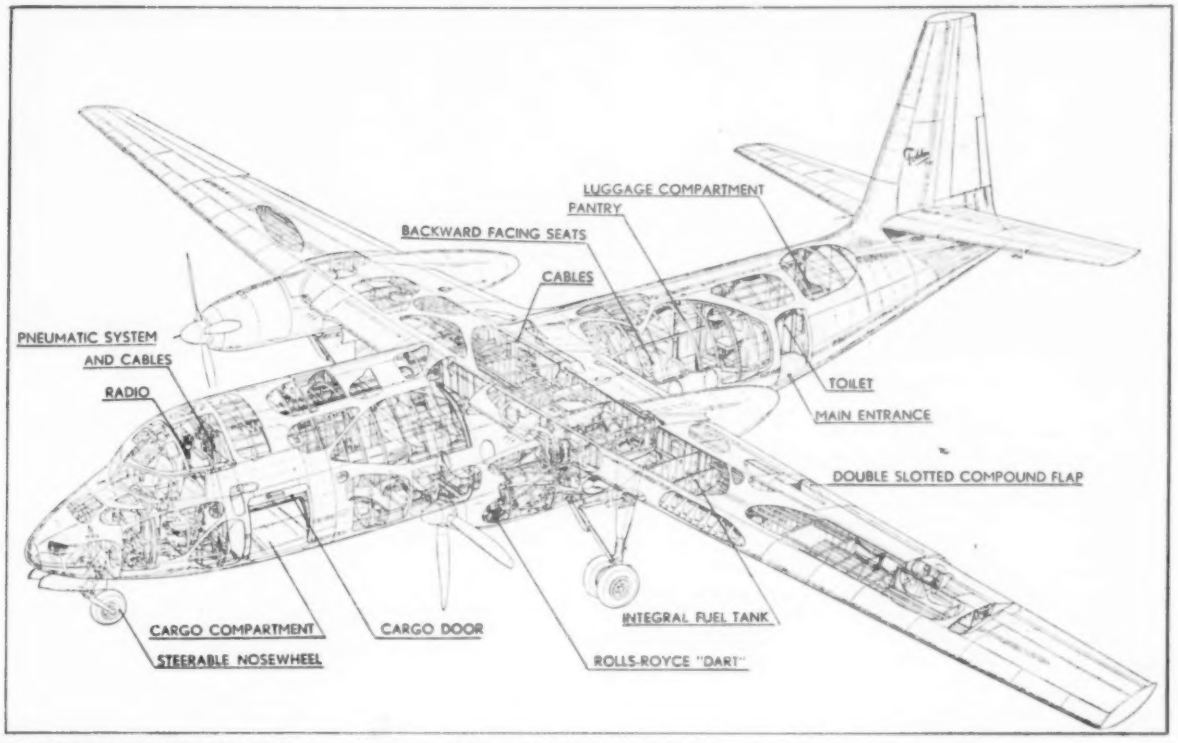



**TURBOPROP FRIENDSHIP'S** highwing arrangement, backward-facing seats and cargo compartments are shown in this cutaway.

***Fairchild Survey Verdict:***

# F.27 Gains Favor as DC-3 Replacement

- **Aviation consultants report interest of local service airlines and trunks in turboprop-powered Friendship.**
- **Fokker will push production of new shorthaul airliner; plans for U.S.-built version are likely to be speeded.**

By Claude O. Witze

Plans of Fairchild Engine & Airplane Corp. to build the Fokker F.27 Friendship, 28-passenger twin-turboprop transport, for the U.S. market have been stimulated in recent weeks by two developments:

• A market survey for Fairchild by Ray & Ray, Washington aviation consultants, has uncovered a promising market with good potential sales to local service airlines and trunklines plus the business aircraft field.

• Fokker Royal Netherlands Aircraft Factories, now building an F.27 prototype that will fly in May and be demonstrated in this country under Fairchild auspices before the end of 1955, will go ahead with production at once without waiting for the flight test program.

Fokker's decision to push production plans immediately was based on the results of its own survey covering sales potential in countries outside the U.S. In addition, the Fokker management is eager to take full advantage of its head start in the field.

Tooling the Netherlands plant will take considerable time, and the production rate will be slower than customary in U.S. aircraft plants.

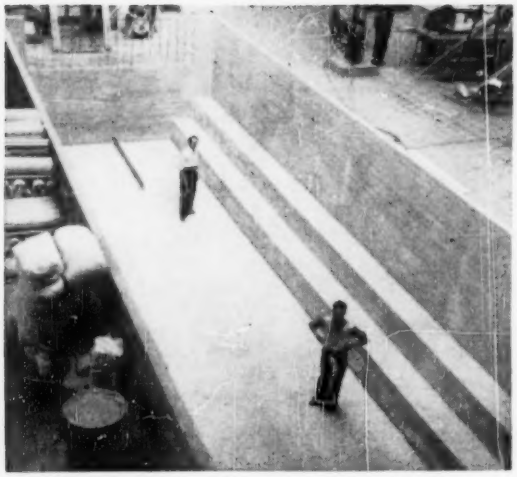
► **Potential Growth**—Fairchild's heretofore tentative plans to build the plane in its Hagerstown, Md., plant were reported likely to proceed with greater speed as a result of the Fokker announcement and the Ray & Ray survey.

The U.S. company has a license agreement with Fokker to build the transport, powered by two Rolls-Royce Dart engines, and sell it in the entire Western Hemisphere—with the exception of Brazil (AVIATION WEEK Sept. 6, p. 77).

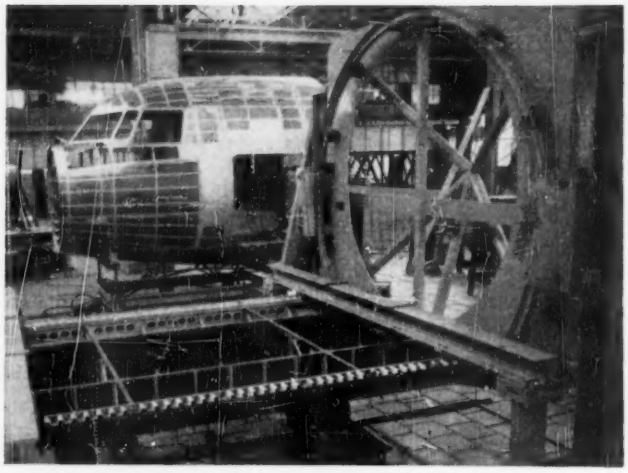
While statistical results of the Ray & Ray survey cannot be made available, AVIATION WEEK has been given some of the factors in the local service airline picture that indicate a growing potential for a plane of the Friendship's type.

► **DC-3 vs. F.27**—Assuming all U.S. feeder lines were limited to DC-3s, they would fly 1,578 hr. a day to accommodate their anticipated traffic in 1956. This operation would need 235 planes. The F.27 Friendship, calculations show, could carry the same amount of traffic in 942 hr. with only 175 transports.

Projecting the figures into 1960, if DC-3s were used for estimated local carrier traffic, the airlines would need 302 planes flying 2,058 hr. a day. With the F.27, passengers could be handled



**PRESSURIZED HULL** will be tested in this basin.



**FRONT FUSELAGE** section takes shape at Fokker's factory.

with 220 transports flying 1,177 hr. a day.

Even with a plane of the F.27 type available and accepted, the replacement would not be complete, although some new equipment must be introduced because clearly there will not be 302 DC-3s available in 1960. According to Civil Aeronautics Administration, peak postwar year for DC-3 operations, including aircraft not in airline service, was 1946, when 470 were flying. The decline has been fairly regular since then, down to 331 in 1953—last year for which figures are available.

▶ **Feeder Optimism**—Third quarter figures published by Civil Aeronautics Board on local carrier traffic support optimism for continued progress in this field of air transport. Compared with the same period of 1953, the passenger load factor on all DC-3 operation is up from 40.83 to 45.64. The average number of passengers carried increased from 41,049 to 49,390. Revenue passenger-miles climbed from 12,142,000 to 13,095,000.

In the case of Mohawk Air Lines, figures for the same quarter in 1953 and 1954 show an increase in load factor from 52.83 to 68.13, while the number of passengers carried climbed from 47,518 to 68,577. Pioneer Air Lines' load factor gained from 43.30 to 52.16 and passengers carried from 32,883 to 44,465.

Non-mail revenue figures for the third quarters of 1953 and 1954 also are optimistic for the local service airlines. For all DC-3 operations, they rose from 54.24 cents a mile to 61.79 cents a mile. Mohawk had an outstanding record in the period; its non-mail revenue jumped from 78.25 to 97.46 cents a mile. The figures for Southwest Airways are 89.59 and 104.33 cents a mile.

In the third quarter of 1954, Mohawk's non-mail revenue fell only 8.03 cents a mile short of meeting its operating expenses, down from 27 cents in the same period last year.

▶ **Subsidy Problem**—Interest in a transport of the Fokker Friendship type—if it develops—is certain to raise a serious problem for CAB. At least one airline, Pioneer, made a valiant attempt to replace its DC-3s with modern 40-passenger transports. The Board refused to pay a higher mail subsidy than warranted by the old equipment, forcing the line to revert to the DC-3.

There is some feeling CAB may have to modify this policy before any local carrier can try to introduce a new and unproven aircraft. There is no expectation that the airlines will ask for a straight increase in mail subsidy to support a transport incurring higher operating costs than the DC-3. In fact, Fairchild and Fokker figures show the F.27 will result in economies.

However, as in the case of the DC-6, operators who pioneer use of a new twin-engine transport probably will need some insurance against heavy losses if "bugs" appear.

▶ **F.27 Outlook**—Other factors considered by Fairchild in its study of the outlook for the new turboprop-powered transport:

• **The Friendship** will be an aircraft in being next year. It will be possible to deliver a Fairchild-built F.27 early in 1957.

• **Longer-term certificates** for local service airlines may be approved. This would stimulate interest of investors and ease the problem of financing new equipment.

• **Introduction of Viscount** service by Capital Airlines next spring is certain to ease adoption by other carriers of the Rolls-Royce Dart turboprop engine, which will power both the Viscount and the Friendship.

At least in the beginning, F.27 operators presumably will have the benefit of engine service provided by Rolls-Royce of Canada, an arrangement that will ease transition to maintenance in their own facilities.

• **Major trunkline interest** in a replacement for the Convair and Martin liners already is evident. One school anticipates some of these airlines will be interested in two planes: a four-turboprop transport of greater capacity than the present twin-engine liners and an aircraft with the F.27's capabilities.

So far, other major U.S. manufacturers have been silent on their plans for a twin-turboprop airliner. At one time, Boeing Airplane Co. had a heavy investment in a project similar to the F.27, but this was shifted to the Fokker project before Fairchild entered the picture. Boeing then put its major effort into pure jet aircraft, climaxed by the 707 and military tanker projects.

▶ **CAA Flight Tests**—Prototype of the F.27 will be flight tested in Amsterdam by CAA and certificated by Holland's Civil Air Organization. An American-built version probably will be priced in the $400,000 to $500,000 range.

The F.27 is a high wing design, 73 ft. long, 26 ft. 6 in. high and with a wing span of 95 ft. It will have a pressurized hull and a cabin capacity of 28 to 36 seats. Normal takeoff weight is given as 32,630 lb. Maximum gross is 34,200 lb. Normal disposable load varies according to configuration, from 10,945 lb. to 11,305 lb.

Maximum cruising speed at 20,000 ft. will be 280 mph. Economical cruising speed at the same altitude is 266 mph. Normal stage distance is 300 mi., maximum 830 mi.

▶ **Many Designs**—Lack of a true replacement for the DC-3 has been a subject of conversation, debate and speculation for many years. American manufacturers have followed the market possibilities closely and designs have been on the boards in several major aircraft

**W. W. Lindsay, Jr.,** Electronics Committee Chairman (left), Sherwood C. Frey, Navy Studies Department Manager (seated), and R. P. Buschmann, Company Studies Department Manager (right), examine relationships between plane and radar performance.

# Operations Research and Systems Analysis

**Dr. L. Alaoglu,** Mathematics Committee Chairman (left), and Ed Quilter, Capt. U.S.N., Ret., Consultant (right), discuss alternate overseas transport routes between the U.S. and Europe.

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plants. In earlier days, the nature of the market that justified a larger aircraft combined with the poor military possibilities to discourage efforts.

Even today, with the development of turboprop engines, there is some strong feeling that both pilots and passengers prefer four-engine aircraft.

A previous serious bid to sell a DC-3 replacement from Europe was made more than five years ago when Saab Aircraft Co.'s Scandia, twin-engine transport for 24 to 32 passengers and powered by Pratt & Whitney R2180 Twin Wasps, was demonstrated to U.S. carriers. It did not sell.

Local airlines, in serious financial straits, stuck to the DC-3. Trunklines favored the American-built Convair and Martin liners with their 40-passenger capacity as more economical.

The Saab is used by Scandinavian Airlines System on European routes. Others are in South America.

**ALL 102 SEATS** in North American Airlines' DC-6B were filled on first east-west hop.

# Nonsked Starts Nonstop Service

North American Airlines inaugurated nonstop DC-6B aircoach service Los Angeles-New York last week. First flight—eastbound to New York with 93 passengers, including West Coast newsmen—was made in 9 hr. 30 min.

On the return flight, the DC-6B carried a capacity load of 102 passengers. Eastbound flights are overnight, westbound are daylight. The plane is the first of two DC-6Bs the nonscheduled airline has on order from Douglas.

► **22-Row Interior**—First flight passengers found that despite the 22 rows of seats, there was adequate and comfortable leg room in the Douglas interior. Bulkheads separating the cabin from the cockpit were moved forward, allowing more room in the passenger compartment.

North American's design eliminates a large buffet and coat racks, giving a clean interior sweep from the tail of the aircraft to the cockpit bulkhead with the exception of a small buffet.

The Burns Aero seats were designed for the North American coach configuration, with double seats on one side of the aisle and triple on the other. Some major airlines have shown an interest in the 102-seat DC-6B designed by Douglas for longrange aircoach operation.

► **105,500-Lb. Takeoff**—Takeoff weight from Burbank Airport on the inaugural flight was 105,500 lb. Sea level takeoff maximum for the aircraft is 107,000 lb.

Headwinds delayed the flight an hour and a half past its 7 hr. 55 min. eastbound schedule. —WJC

# Benson Asks Cargo Flights on East Coast

Request for expedited action on air cargo service along the East Coast has been filed with Civil Aeronautics Board by Agriculture Secretary Ezra Taft Benson.

Benson asks the Board to sever the north-south segment of the airfreight renewal case from the east-west to allow an early decision or, alternately, to grant one or more temporary exemptions to allow service while a decision is being reached.

In his petition, Secretary Benson asks for immediate action so that shippers of perishable agricultural products at various points from Boston to Miami will have all-cargo service during the heavy winter season.

# NATCC Takes New Noise Abatement Steps

National Air Transport Coordinating Committee's aircraft noise abatement program for the New York metropolitan area is being intensified further. The committee's executive director, Vice Adm. C. E. Rosendahl, says three new measures should go a long way toward alleviating the noise problem:

- **Signs at takeoff ends** of runways as reminders to pilots of special noise abatement flight procedures.
- **Relocation of anemometers** that register wind information.
- **Installation of reference lights** to guide aircraft over unpopulated areas on night takeoffs on Runway 13 at LaGuardia Airport.

► **First Tests**—Rosendahl says the signs at takeoff ends of runways not only will serve as last-minute reminders of special NATCC procedures but will reduce the amount and varieties of radio transmission between airport control towers and aircraft that are preparing to take off.

First tests of these signs will be made at LaGuardia and Newark Airports, since special turns after takeoff at both terminals take aircraft away from populated areas to make their initial climbs over open terrain. This applies to Runway 13 at LaGuardia and Runway 4-22 at Newark.

► **Key Factor**—On wind information, NATCC's executive director says in some instances anemometers are located at heights that at times could have recorded velocities greater than those actually existing at the height of aircraft on the runways.

By relocating the anemometers, NATCC hopes there will be more velocity readings of 15 mph. or less, with proportionate gain in use of preferred runways.

The admiral notes that wind velocities are a key factor in the preferential runway system installed by NATCC to permit as many landings and takeoffs as possible, consistent with safety, on those runways leading aircraft over water and unpopulated areas.

Because of the safety considerations, this system is limited to times when winds are of 15 mph. or less in velocity and directionally not more than 80 deg. from the runway heading.

► **Pilot Guide**—Regarding the use of reference lights, Rosendahl cites one recently installed in Flushing Meadows, near LaGuardia. Reports from a preliminary one-month's survey show the light helped guide a majority of pilots over the open area of Flushing Meadows Park—avoiding adjacent residential areas.

The light was installed after numerous flight tests by NATCC's technical

committee had indicated that it was difficult to fly directly over the meadow at night, due partly to terrain features hard to identify in darkness.

The experimental reference light test will continue for an indefinite period, according to Rosendahl, "until we have obtained experience with it in a wide variety of weather conditions."

In this way NATCC hopes to determine if the light will be adequate and warrant further installations.

## CAA to Let Test Pilots Certify New Aircraft

Civil Aeronautics Administration will designate flight test pilot representatives from private industry as CAA safety representatives to speed certification of new aircraft and approval of modifications.

Advantages of the new type safety agent, CAA says, are:

- Faster service to the aviation industry.
- Federal agents are kept to a minimum.
- Aviation industry is encouraged to take increased responsibility for flying safety.

## CAB Settles Ocean Mail Rate Cases

Civil Aeronautics Board has decided the eight-year-old trans-Atlantic final mail rate case, setting past and future pay for Trans World Airlines, Pan American World Airways and the now defunct American Overseas Airlines.

Mail pay set for the carriers:

- **Trans World Airlines,** for the period Feb. 5, 1946, to Dec. 31, 1953, gets $50,730,000 for international operations, a decrease of $365,000 from amounts received under temporary rate orders.
- **Pan American World Airways,** for the period Jan. 1, 1946, to Dec. 31, 1953, gets $90,469,000 for Atlantic Division operations, an increase of $6,810,000 over amounts received under temporary orders.
- **American Overseas Airlines,** for the period Jan. 1, 1946, to Sept. 25, 1950, gets $22,107,000, an increase of $4,792,000 over amounts received under temporary rate orders.
- **Trans World Airlines,** for the period beginning Jan. 1, 1954, gets $4,281,000 a year for its international operations.
- **Pan American World Airways,** for the period beginning Jan. 1, 1954, gets $8,151,000 a year for its Atlantic Division operations.

The mail pay awarded Pan American and TWA for past and future periods is subject to any adjustments which may develop from a Board investigation to see whether profits from other divisions are available for offset against trans-Atlantic operations in line with the Supreme Court's Chicago & Southern decision.

▶ **Encouraging View**—Annual mail pay awarded PAA and TWA for future operations amounts to about half that recommended in the examiner's initial decision. Rate of compensation for both airlines is the same in areas where they have comparable operations.

The Board took an encouraging view of TWA's improvements since 1952 and foresees the possibility that the carrier's Atlantic operations will not require subsidy assistance in 1954. CAB also found that if substantially all military mail is shifted to certificated carriers, as currently planned, there is a "substantial possibility" that TWA's trans-Atlantic operation will be conducted subsidy-free.

▶ **Reduced Rates**—In a separate action, CAB set new temporary service mail rates for the trans-Atlantic services of PanAm and TWA and the trans-Pacific services of PanAm and Northwest.

These rates were reopened last April for review and reduced temporary rates were set—67 cents a ton-mile in the Atlantic and 60 cents a ton-mile in the Pacific. The Board decided these were too high in view of decreasing cost trends and an increase in the volume of military mail being carried.

New temporary rate for the Atlantic area for the period Apr. 8, 1954, to Dec. 31, 1954, is 56.40 cents a ton-mile. After Jan. 1, 1955, the rate will be 55 cents. New temporary rate in the Pacific for Apr. 8, 1954, to Dec. 31, 1954, is 56.35 cents a ton-mile. After Jan. 1, the rate will be 50 cents.

## ATA Elects Board, Approves '55 Budget

Air Transport Assn. has elected four new directors to serve on the ATA board and approved a budget for 1955.

New board members are Charles E. Beard, Braniff Airways; G. T. Baker, National Airlines; Donald W. Nyrop, Northwest Airlines, and C. A. Myhre, Frontier Airlines.

Re-elected to the board: W. A. Patterson, United Air Lines; C. R. Smith, American Airlines; J. T. Trippe, Pan American World Airways; Leslie Barnes, Allegheny Airlines; E. V. Rickenbacker, Eastern Air Lines, and W. L. Pierson, Trans World Airlines.

Willis Player, director of public relations, was elected a vice president.

▶ **Public Relations Program**—The board approved an undisclosed sum for the budget for the first half of 1955. The budget for the first six months of 1954 was $595,000.

An industry public relations program was approved, as was a full-time secretary for the ATA international and facilitation committees. The board also passed a resolution approving an Army proposal for airline operation of military helicopter types on an experimental basis.

▶ **Local Service Push**—At a meeting of the 14 member presidents, the Conference of Local Airlines elected three new directors: Hal N. Carr, North Central Airlines; Robert Peach, Mohawk Airlines, and John Connelly, Southwest Airways. Continuing as directors are T. H. Davis, Piedmont Airlines; Laddie Hamilton, Ozark Air Lines, and Nick Bez, West Coast Airlines.

## CAB ORDERS

(Dec. 9-15)

**GRANTED:**

**Safeway Airways'** application for renewal of its exemption to perform air service in Alaska until 60 days after a decision in the investigation of intra-Alaska air services case.

**Western Air Lines,** the city and county of San Francisco and the San Francisco chamber of commerce leave to intervene in the Guatemala City-Los Angeles renewal case.

**Transocean Air Lines** an exemption to operate one charter flight from Athens, Greece, to New York via Munich, Germany, Dec. 14, 1954.

**Flying Tiger Line** an exemption to operate one charter flight from Munich, Germany, to New York on or about Dec. 14, 1954.

**North Central Airlines'** application to serve International Falls, Minn., on a year-round basis, until Sept. 30, 1955.

**APPROVED:**

**Intercompany agreements** involving Trans World Airlines and United Air Lines and various other carriers.

**Certain agreements** providing for the lease and purchase by Alaska Coastal Airlines of the properties of Alaska Island Airlines.

**Pioneer Air Lines'** Harding L. Lawrence and Arthur F. White's interlocking relationships with Pioneer Aeronautical Services, Inc.

**EXTENDED:**

**Delta C&S Air Lines'** authority to suspend service temporarily at Kingston, Jamaica, for one year.

**DENIED:**

**Braniff Airways'** application to suspend service temporarily at Norfolk, Neb.

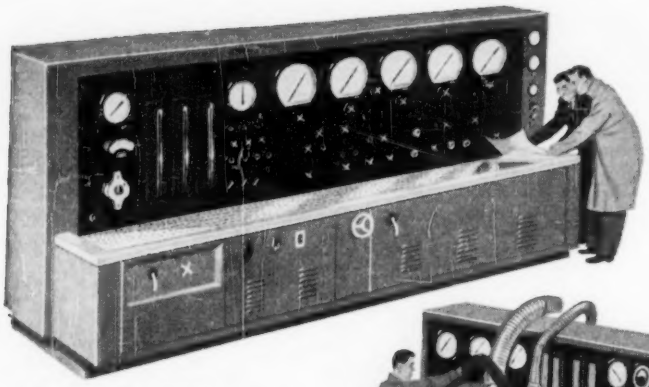
**ORDERED:**

**Los Angeles Airways** to show cause why mail rates determined by CAB should not go into effect.

**Alaska Airlines'** final mail rate be reopened to determine a new rate or take other appropriate action.

**Northern Consolidated Airlines'** final mail rate be reopened for the purpose of determining a new rate or taking other appropriate action.

**North Central Airlines** mail rates, found fair and reasonable in Order No. E-8789, be fixed as final.



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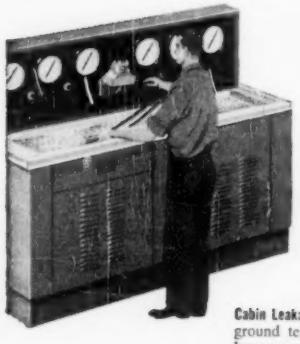

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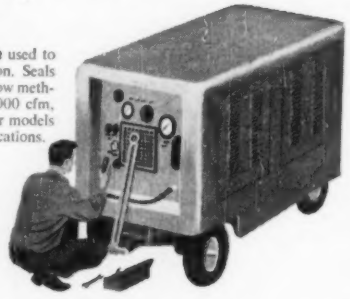

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## AVIATION CALENDAR

**Jan. 10-11**—Helicopter Association of America, 7th annual meeting, Warwick Hotel, Philadelphia.

Jan. 10-14—Society of Automotive Engineers, annual meeting and engineering display, Sheraton-Cadillac and Hotel Statler, Detroit.

Jan. 19-23—Miami International Aerorama, Miami (Fla.) International Airport.

Jan. 20-21—Institute of Radio Engineers and Radio-Electronics-Television Manufacturers Assn., Symposium on Printed Circuits, University of Pennsylvania, Philadelphia.

Jan. 20-22—Conference on High-Speed Aerodynamics, organized by the Department of Aeronautical Engineering of the Polytechnic Institute of Brooklyn, Engineering Societies Building, New York.

Jan. 24-27—American Meteorological Society, 135th national meeting, New York.

Jan. 24-27—Plant Maintenance & Engineering Show and three-day conference, International Amphitheatre, Chicago.

Jan. 24-28—Institute of the Aeronautical Sciences, 23rd annual meeting, Honors Night Dinner, Hotel Astor, New York.

Jan. 27-28—Southern California Meter Assn., fourth annual Instrument Short Course, Los Angeles Harbor Junior College, Wilmington, Calif.

Jan. 31-Feb. 4—American Institute of Electrical Engineers, winter general meeting, Hotel Statler, New York.

Feb. 8-10—Society of the Plastics Industry, 10th Reinforced Plastics Division Conference, Hotel Statler, Los Angeles.

Feb. 10-11—Society of American Military Engineers, military-industrial conference on manpower, Conrad-Hilton, Chicago.

Feb. 20-22—Fourth annual Texas Agricultural Aviation Conference, A&M College of Texas, College Station, Tex.

Mar. 11—Institute of the Aeronautical Sciences, National Flight Propulsion Meeting (restricted), Hotel Carter, Cleveland.

Mar. 14-16—Society of Automotive Engineers, production meeting and forum, Netherland Plaza, Cincinnati.

Mar. 14-17—American Society of Tool Engineers, 1955 annual meeting, Shrine Auditorium, Exposition Hall, Los Angeles.

Mar. 21-24—Institute of Radio Engineers, national conference, Waldorf-Astoria Hotel and Kingsbridge Armory, New York.

Mar. 28-Apr. 1—American Society for Metals, ninth Western Metal Exposition and Congress, to include the American Welding Society's technical session on aircraft and rocketry, Pan Pacific Auditorium and Ambassador Hotel, Los Angeles.

Mar. 31-Apr. 1—Symposium on Boundary Layer Effects in Aerodynamics, Britain's National Physical Laboratory, Teddington, England.

Apr. 6-10—World Plastics Fair & Trade Exposition, National Guard Armory, Los Angeles.

Apr. 18-21—Society of Automotive Engineers, Golden Anniversary Aeronautic Meeting, Aeronautic Production Forum and Aircraft Engineering Display, Hotel Statler and McAlpin Hotel, New York.

Apr. 18-22—American Rocket Society, spring meeting, Baltimore.

Apr. 24-28—Airport Operators Council, 1955 convention, Olympic Hotel, Seattle.

*For Engineers . . .*

# Clear Horizons ahead

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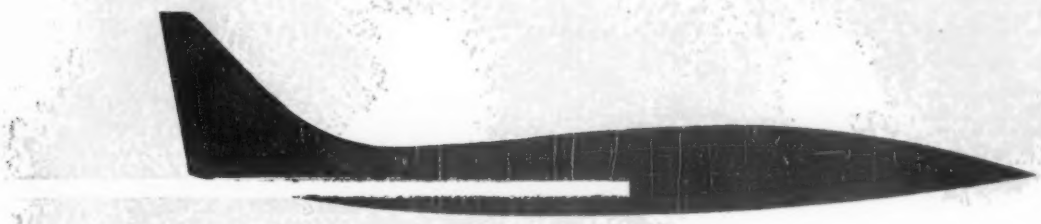

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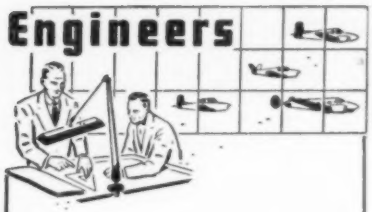


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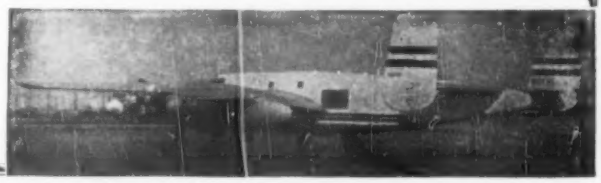

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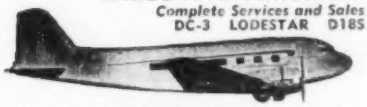

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# Too Many Ground Accidents?

## Dr. McFarland urges airlines to adopt modern safety engineering to prevent employe injuries.

By Dr. Ross McFarland

While the achievements in flight safety in air transportation have been quite remarkable, the safety record for ground operations is in sharp contrast. In fact, the accident frequency and severity rates among line maintenance and base repair workers put them well toward the bottom in a ranking of the safety of 40 industries reporting to the National Safety Council.

The airlines as a whole have been rather slow to take full advantage of modern safety engineering in solving the wide variety of problems in the shops and hangars and on the ramps. Even now the safety departments of the airlines have not attained organizational status comparable with that existing in other established industries, and are often a first target of economies.

**Hazards Are Many**—The wide diversity of occupational hazards that are present within the limited working areas of hangars, shops and ramps form an important factor in this poor record.

The pressure for maintenance of flight schedules and the high utilization of expensive transports requires a high integration of working crews and a heavy concentration of personnel and equipment in narrow limits of space and time.

Some hazards are inherent in the design of modern transports. Planes stand high off the ground; surfaces rounded and polished for aerodynamic reasons offer little foothold and handhold; aerials and propellers project to invite "strike-against" accidents; interior working spaces crowded with equipment of many kinds foster a variety of contact hazards; volatile fuels, inflammable fluids, and toxic solvents require special precautions.

Analysis shows that the majority of servicing accidents occur in the powerplant and cargo areas of transports.

**What Kinds of Injuries?**—A striking feature of accidental injuries among ground personnel is the way certain types keep recurring, year after year, in about the same proportions. Lacerations and abrasions, and foreign bodies in the eye, are the most frequent. Hands and fingers are most often involved, and the majority of these laceration and abrasion injuries resulted from the misuse of tools, e.g., the slipping of a poorly fitting screwdriver or wrench.

Puncture wounds were attributed almost entirely to the use of safety-wire, cotterpins, screwdrivers, and steel wool. Flying particles from grinding and machining operations, from the slip stream of a propeller, or from the use of compressed air constitute a real hazard to eyes.

An analysis like this can result in adoption of protective devices.

Eye injuries constituted 11% of the lost-time accidents for one airline, whereas in another, where hazards are comparable, the better control and use of protective devices kept eye injuries to 2.5%.

More important from the standpoint of severity, though less frequent, are the strains, fractures and back injuries associated with improper handling of materials and falls.

**What Are the Causes?**—The accidents for one year in the maintenance unit of a large airline were studied. Half of the accidents were revealed as arising from five main causes: (1) unsafe practices in the use of equipment, (2) use of defective equipment, (3) unsafe practices in handling materials, (4) poor housekeeping and oily surfaces, and (5) unsafe practices in the use of hand tools.

Included in each of these five causes are such implicit factors as lack of supervision, and inadequate training in the efficient and safe ways of carrying out the necessary tasks.

**Training, Supervision, and Safety**—In attempting to prevent ground accidents, the training and experience of workers require special emphasis. It is well known that turnover is high and continuance rates are low among ground personnel. Consequently, a substantial number of employes are almost certain to have incomplete training, and accident rates among inexperienced maintenance personnel have been found to be higher.

The variety of tasks and working conditions makes the standardization of procedures—and even of protective devices—difficult. Early, thorough indoctrination of workers in safety principles, and training in safe working methods are essential. Inadequate supervision also can increase accident rates materially.

**Designing for Safety**—One of the most important areas for improving safety at maintenance bases or on the operating ramps is the design of equipment in terms of human capabilities and limitations. Machines and working areas must be built around the workers, rather than placing workers in a setting without regard for each individual's requirements and capacities.

Unless this is done, it is hardly fair to attribute so many accidents to human failure as is usually done.

**Human Engineering**—All possible faults in equipment should be subjected to advance analysis for accident prevention. If defects are present, it is only a matter of time before some worker "fails" and has an accident. Errors can arise if equipment is not suited to the worker's size, or to his capacities and limitations. Data on human body size can be incorporated in equipment even at the design-board stage.

Arm-reach, for instance, should influence the location of a control. Splash guards and machine aprons should be so designed that work is within easy reach of the operator. The pressure required to work controls should be within the strength of the weakest person expected to operate the machine. The limitations of human perception must be considered in the original design of gages, meters, or dials, if errors are to be avoided.

**Basic Safety Principles**—No safety program can succeed without sustained management support and direction. Programs must also be based on a recognition that accidents may arise from: (1) the materials used, (2) the machines operated, (3) the working environment, (4) the working methods, and (5) the men using the equipment and doing the work.

The physical control of hazards is important; of no less importance is control which recognizes the role of human factors. This control involves the selection, training, and supervision of personnel, and the design of equipment and working procedures with due regard to human capabilities and limitations.

**This is the second of a series of articles being written for Aviation Week by Dr. McFarland, associate professor of industrial hygiene at the School of Public Health, Harvard University.**

**Companies wishing to evaluate the effectiveness of their own programs for accident control will find methods and information in the writer's current book, "Human Factors in Air Transportation—Occupational Health and Safety," published by McGraw-Hill, New York.**

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# EDITORIAL

## Time for a Nonsked Decision

Now comes a well-known perennial nonsked, a "large irregular carrier," with the first of two new 102-passenger Douglas DC-6Bs, operating the first daily transcontinental nonstop coach service in history. Westbound flights make one stop.

Fares remain the same as on the company's DC-4s: $88 one way, plus tax. Scheduled carriers, offering coast-to-coast coach service in both directions with at least one stop, charge $99, plus tax, with no special roundtrip rate. This carrier offers a roundtrip for $160, plus tax, good Mondays through Thursdays.

This operator thus becomes the first "nonscheduled" carrier to offer, with late model aircraft, a transcontinental coach service faster than that of any scheduled airline.

Like most problems that are allowed to drag, the importance of whether to certificate nonscheduled carriers has been growing enormously as Civil Aeronautics Board has permitted it to drift.

This carrier's new service, with aircraft that cost over a million dollars apiece, suddenly dramatizes again the rising importance of irregular carriers and the importance of defining their role and regulating them.

Nonstop coast-to-coast flights in new DC-6Bs can hardly be called third-class service. There is no longer any possible excuse for Board inaction in the contention that this one line offers grossly inferior accomodations to those of regular carriers.

The Board has vacillated over the years in an erratic, stumbling series of threats, revocations, new regulations, definitions, and varying interpretations of definitions. But it has never really known or made up its mind on the subject. Sen. Pat McCarran, co-author of the Civil Aeronautics Act, said: "By seeking to write a definition of an irregular carrier they (CAB) have made it difficult for a conscientious operator, who honestly seeks to run an irregular service, to know whether he is operating within the law or not. In the same way, they have opened up an avenue for evasion of the law, of which great advantage has been taken."

The Board's enforcement case against this particular line is in hands of an examiner, but Board people doubt if a decision can be reached in less than two to five months. It has dallied on the company's certification case for many months.

Both the certificated industry and the Board seriously underestimated the potentialities of the low-priced air-coach market when the lowly nonskeds set up shop with war-weary DC-3s and 4s shortly after World War II ended. But the business grew constantly, despite a high bankruptcy rate among the nonsked or irregular carriers. There are few common-carrier nonskeds left—most of them are charter operators—but the remaining group is the strongest of the lot.

By the time the Board wished to throttle the nonskeds, it found that a well-developed public opinion—including some support on Capitol Hill—seemed to make allout action politically dangerous, so it still refused to take the nonsked bull by the horns.

The scheduled industry probably could have eliminated this pesky common carrier competition by 1953 by bracketing the nonsked schedules, reducing fares a second time, from the $99 coast-to-coast rate where it is now, down to $75 or $80. CAB probably would have welcomed such fare petitions for second- or third-class service. But the industry didn't go all out, either, and meanwhile the large irregulars have grown.

The largest line alone reports to CAB that it hauled 147,200 revenue passengers in the first nine months of 1954, and Board officials guess that the fourth quarter may show as many as 65,000-70,000.

A few days ago, CAB announced that all irregular carriers will tote about 650,000 passengers this year, for a total of 1.3 billion passenger-miles. This includes military and civilian charter business, as well as common carrier traffic.

There appear to be three general directions CAB could take: (1) it could permit the present chaos and uncertainty to continue, which is obviously unsatisfactory to both regular and irregular carriers alike; (2) it could attempt—unsuccessfully, we believe—to put most or many of the irregular carriers out of business; or (3) it could aver that there is a niche for the irregulars, define it, and put those who meet the requirements into it, under proper regulation. End the exemptions!

Last Apr. 19 on this page, AVIATION WEEK urged editorially that the government's Air Coordinating Committee in its then forthcoming recommendations on the new Administration's air policy "clear away some of the confusion and enunciate a firm stand for maximum use and encouragement of this country's irregular operators without imperiling the financial foundation of any other segments of the commercial airline industry."

The report that came out later did, in fact, state that "some operations of large irregular carriers, such as bona fide charter and contract operations, can and do provide services which are supplemental to those authorized by regular route certificates. . . . There appears to be a valid role which the irregular carriers can fill in this specialized market. It is appropriate for the government to encourage the development of this specialized market . . ."

The report recommended some "basically new type of certificate" for large irregular carriers. It also said "in the future" there should be no general use of the exemption authority as a basis for authorizing "common carrier transportation to individually ticketed passengers on large transport planes."

President Eisenhower accepted the report May 26, and said it "reflects this Administration's central objective in this field—to strengthen American aviation . . ." CAB, however, did not participate in preparation of the section of the report dealing with nonscheduled operations "because of direct applicability to cases now before it."

Nor has CAB taken any forceful or decisive action on the general subject since the President's Air Coordinating Committee report was accepted by the White House six months ago.

—Robert H. Wood

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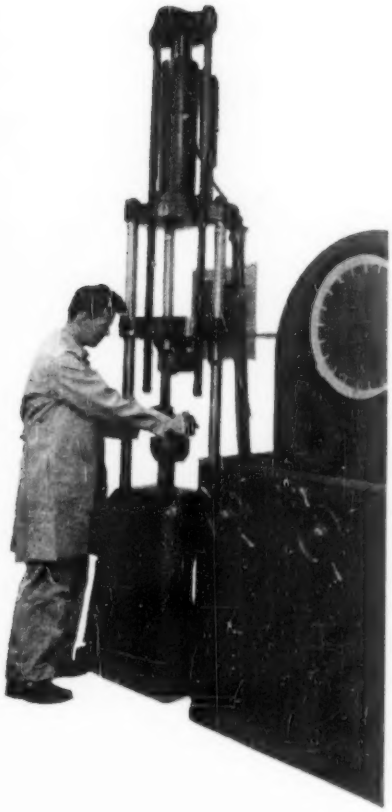

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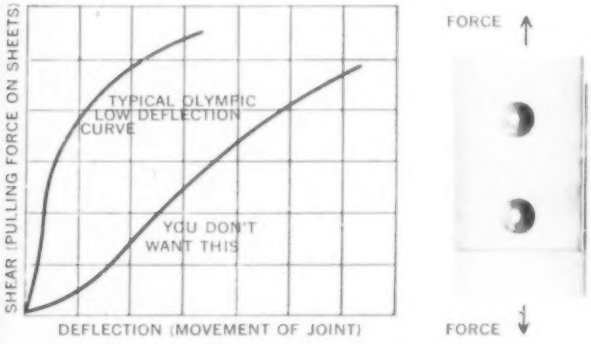


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